DISSERTATION ON

ASSESSMENT OF COGNITIVE FUNCTION IN TYPE 2 DIABETIC PATIENTS IN A RURAL TERTIARY HEALTHCARE FACILITY

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THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY

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CERTIFICATE

This is to certify that this dissertation entitled **"ASSESSMENT OF COGNITIVE FUNCTION IN TYPE 2 DIABETIC PATIENTS IN A RURAL TERTIARY HEALTHCARE FACILITY"** is a bonafide original work of **Dr.R.V.S.VELMURUGAN** in partial fulfillment of the requirements for the award of the degree of M.D in PHYSIOLOGY (Branch – V) and examination of the Tamilnadu Dr. M.G.R. Medical University to be held in MAY - 2018. The period of study was from 2015 – 2018.

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I, **Dr. R.V.S.VELMURUGAN** solemnly declare that the dissertation titled **"ASSESSMENT OF COGNITIVE FUNCTION IN TYPE 2 DIABETIC PATIENTS IN A RURAL TERTIARY HEALTHCARE FACILITY"** was a bonafide work done by me at Dhanalakshmi Srinivasan Medical College and Hospital, Siruvachur, Perambalur during 2015 - 2018 under the guidance of my Professor and Head of the Department **Dr.M.ANBARASI,M.D.**

This dissertation is submitted to TamilNadu Dr.MGR Medical University, towards partial fulfillment of requirement for the award of M.D Degree (Branch-X) in physiology.

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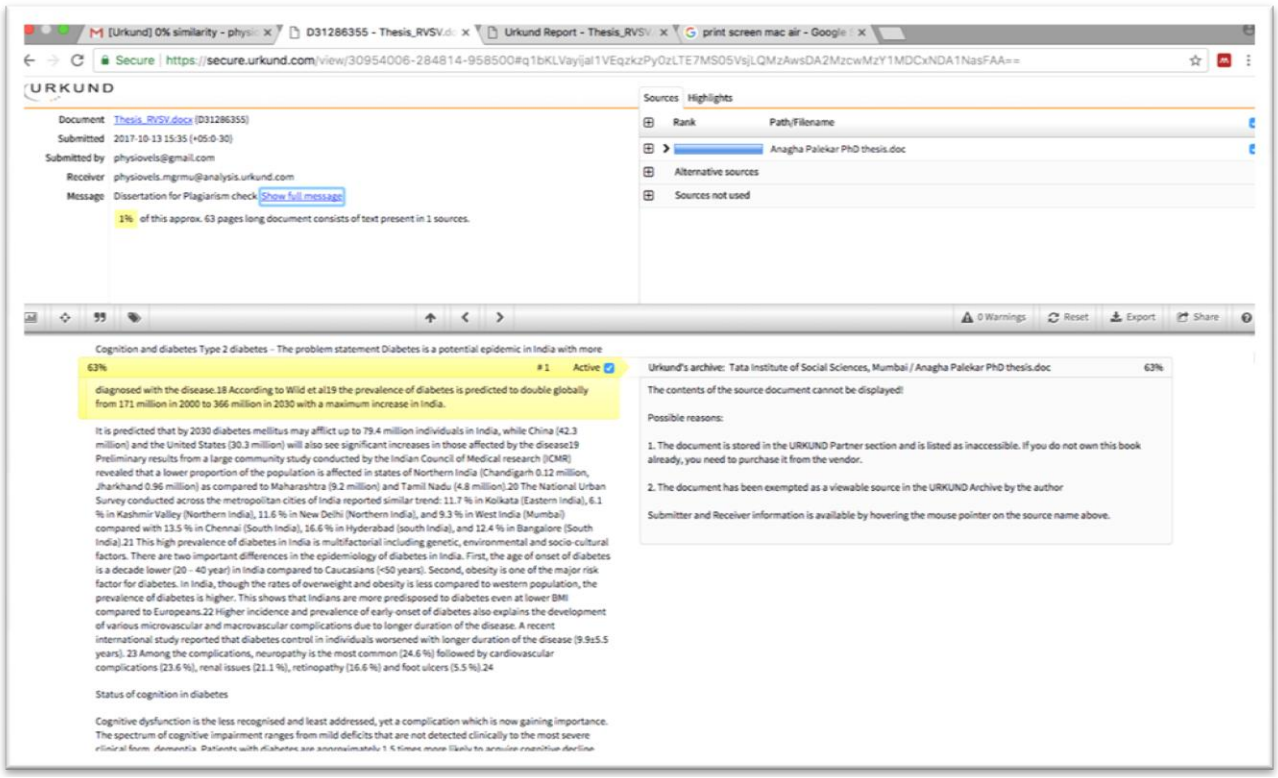

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ABBREVIATIONS

1. T2DM –Type 2 Diabetes Mellitus
2. WHO- World Health Organization
3. HbA1c- Glycosylated Haemoglobin
4. RBS-Random Blood Sugar
5. FBS- Fasting Blood Sugar
6. PPBS- Post Prandial Blood Sugar
7. MMSE-Mini Mental State Examination
8. AVRT- Audio Visual Reaction Time
9. VRT_R-Visual Reaction Time Red
10. VRT_G – Visual Reaction Time Green
11. ART-Auditory Reaction Time
12. CAHD-Coronary Artery Heart Disease
13. HT-Hypertension
14. CKD-Chronic Kidney Disease
15. BMI- Body Mass Index
16. PSQI- Pittsburgh Sleep Quality of Life Index
17. HT- Hypertension
18. CT- Computed Tomography
19. MRI- Magnetic Resonance Imaging
20. IGF- Insulin Like Growth Factor

21. AD – Alzheimer Disease
22. NAFLD – Non Alcoholic fatty Liver Disease
23. CI – Cognitive Impairment
24. LOAD – Late onset Alzheimer Disease
25. MCI – Mild Cognitive Impairment
26. NMDA – N-Methyl-D-Aspartate
27. fMRI – functional Magnetic Resonance Imaging
28. SRT – Simple Reaction Time
29. CNS – Central Nervous System
30. ESRD – End Stage Renal Disease
31. CEN – Central Executive Network
32. SN – Salience Network
33. DMN – Default Mode Network
34. DSM -5 – Diagnostic and Statistical Manual of Mental Disorders
35. ICMR – Indian Council of Medical Research
36. CDC – Centre of Disease Control
37. US – United States
38. AGEs – Advanced Glycation End products
39. SPECT – Single-Photon Emission Computed Tomography
40. PET – Positron Emission Tomography
41. EEG – Electro Encephalogram

ASSESSMENT OF COGNITIVE FUNCTION IN TYPE 2 DIABETIC PATIENTS IN A RURAL TERTIARY HEALTHCARE FACILITY.

ABSTRACT

BACKGROUND

Diabetes Mellitus is a complex metabolic disorder with increasing prevalence both in urban and rural areas and it poses a great public health disaster requires a greater responsibility on health care system for early detection and management of the Micro and Macrovascular complications studied extensively but cognitive dysfunction is one of the least noted and poorly recognised complication of both type 1 and type 2. Several factors including Insulin resistance mediates cognitive impairment and neurodegeneration. Chronic Hyperglycemia, increased duration of Diabetes, and increasing age of the patients are the three important factors influencing the impairment of cognition. Additional factors like gender, lifestyle factors, smoking, alcohol consumption, psychosocial factors, Vitamin D deficiency, Testosterone deficiency, and subclinical thyroid dysfunction have still to be elucidated. Glycemic status – particularly, which affects peripheral nerves in the somatosensory system and auditory system which in turn slows psychomotor responses and has cognitive effects all of which may affect. Reaction Time both Auditory and Visual are considered as ideal tool for measuring sensory motor association and performance of an individual and also has physiological

significance and is a simple and non invasive test for peripheral as well as central neural structures studied.

AIM

The purpose of the study is to assess the prevalence of Cognitive dysfunction in Type 2 Diabetic Patients in a Rural Tertiary Healthcare Facility and to correlate cognitive function through MMSE and visual and auditory reaction time with respect to multiple factors like age, sex, gender, education, BMI, lifestyle factors, smoking, alcohol and diet.

MATERIALS AND METHODS:

This is a **Cross sectional study** done in 376 Type 2 Diabetic patients aged 30-60 years of both gender, after getting approval from the Institutional Ethics Committee in the OPD & IPD of our institution. After explaining the need and the procedures involved in the study and getting written consent, the study participants are subjected to the detailed general and systemic examination. Biochemical parameters are noted with the available record. Cognitive function was assessed using Mini Mental State Examination [**MMSE**] and **Visual and Auditory Reaction time** assessed using the apparatus "Reaction time analyser_501-004-TR [Psychotronics, Bangalore]. The data recorded were analysed using appropriate statistical tests after testing for normality, using SPSS 17.0. A probability value of <0.05 is considered to be statistically significant with 95% confidence limit.

RESULTS AND DISCUSSION

With the mean age group of 51.47±8.04years and male: female ratio of 211:165, the prevalence of cognitive dysfunction was found to be 62.8% (mild cognitive impairment - 41.3% and 21.5% - severe cognitive impairment. The median scores of MMSE were 22 (10-30). Diabetic men found to have better MMSE scores (23.00 ± 5.87 Vs 20.52 ± 4.2; p <0.0001) and lower visual and auditory reaction time (521.22 ± 199.89 Vs 560.25 ± 185.59, p – 0.05 for VRT_ Red light and 417.33 ± 160.20Vs 468.47 ± 187.67, p- 0005 for ART, respectively). BMI shows positive correlation with MMSE scores (r=0.143, p=0.006). Smokers showed decreased MMSE scores (p=0.001) and alcoholics showed decreased MMSE scores (p=0.0001) and increased visual and auditory reaction time (VRT_Green – p =0.03, VRT_Red – 0.02 and ART -0.02). HbA_1C, fasting and post-prandial blood sugar levels were positively correlated with reaction time. As the level of Literacy decreases, cognitive impairment increases. Diet, physical activity and duration of diabetes were not significantly associated with cognitive impairment.

CONCLUSION

In this cross-sectional study on cognitive functions diabetic patients we found higher prevalence of cognitive impairment. Gender, glycaemic control, obesity, literacy, smoking, alcohol have been shown to associate with cognitive impairment.

Keywords: **Cognition, BMI, Education, Glycaemic control, MMSE, Reaction time and Type 2 diabetes mellitus.**

Introduction

INTRODUCTION

Diabetes mellitus is a complex metabolic disease which results in complications that are more devastating than the disease. The common and most studied complications of diabetes include macro vascular complications like cardiovascular and peripheral vascular diseases and micro vascular complications like nephropathy, retinopathy and neuropathy. Cognitive dysfunction is one of the least noted and poorly recognized complication of both type 1 and type 2 diabetes mellitus, though it is gaining its importance in the present days.[1] Over the past several years, evidence that showed impairment in brain insulin and Insulin-like Growth Factor (IGF) signaling, mediates cognitive impairment and neuro-degeneration has developed particularly in relation to mild cognitive impairment and Alzheimer disease(AD).[2] The working hypothesis is that peripheral insulin resistance promotes or exacerbates cognitive impairment and neuro-degeneration by causing brain insulin resistance. Mechanistically, insulin resistance with deregulated lipid metabolism leads to increased inflammation, cytotoxic lipid production, oxidative and endoplasmic reticulum (ER) stress. Insulin resistance is linked to obesity, T2DM, NAFLD, metabolic syndrome, polycystic ovarian disease, age-related macular degeneration, and AD epidemics[2]

Diabetes in older adults has become a major public health problem

affecting an increasing number of individuals worldwide. Both old age and diabetes are independently associated with an increased risk of cognitive dysfunction; the risk is even greater for older adults with diabetes[3]

The most common cognitive deficits identified in patients with type 1 diabetes are slowing of information processing speed and worsening psychomotor efficiency[4]. Type-2 diabetes has been associated with a decrease in psychomotor speed, frontal lobe/executive function[5], complex motor functioning, verbal fluency[6], verbal memory, processing speed[7], working memory[5], immediate recall, delayed recall, visual retention and attention[1]

Chronic hyperglycemia, increased duration of diabetes and the increasing age of the patients are the three important factors influencing the impairment of cognitive dysfunction in diabetics[8]. However, additional causal factors such as gender, lifestyle (physical and mental activity), smoking, alcohol consumption, psychosocial factors (social activity), vitamin D deficiency, testosterone deficiency, and subclinical thyroid dysfunction have still to be elucidated. Type 2 diabetes (T2DM) appears to be a risk factor for Cognitive impairment (CI)[9]. Since the prevalence of type 2 diabetes is ever increasing, understanding both the frequency and the possible causes of diabetes-related cognitive impairment becomes necessary because CI reduces quality of life, and may cause neuropsychiatric symptoms and disabilities to worsen, increasing health care costs.

In a commentary published by Sequist[10], a question was raised if the dementia and cognitive dysfunction identified in elderly subjects with type 2 diabetes is related to their co morbidities and age, or is it the result of a diabetes-related process that begins years earlier. These questions are to be considered very crucial in every diabetic patient and it has to be attended at an earlier stage rather than waiting till the occurrence of dementia.

This study was initiated with the aim of detecting the prevalence of mild cognitive impairment in type 2 diabetic patients and the possible factors that are associated with the condition.

Review of Literature

REVIEW OF LITERATURE

Cognition

Ulrich Neisser, Father of cognitive psychology, has defined cognition in his book titled 'Cognitive psychology' as "all processes by which the sensory input is transformed, reduced, elaborated, stored, recovered, and used." It is concerned with these processes even when they operate in the absence of relevant stimulation, as in images and hallucinations. Such terms as sensation, perception, imagery, retention, recall, problem-solving and thinking among others refer to hypothetical stages or aspects of cognition.[11]

The word 'Cognition' is a late Middle English term, derived from a Latin word "Cognosoere" which means "get to know".

Physiology of cognition

A key recent advance is in understanding the functions and interrelationships between 3 brain networks: the central executive network (CEN), the salience network (SN), and the default mode network (DMN)[12] (Table 1)

Table. 1. Brain Networks and Related Cognitive Processes

Network	Regions involved	Description
Central executive network (CEN)	Dorsolateral prefontal cortex Posterior parietal cortex	Active for demanding tasks requiring attention
Default mode network (DEN)	Posterior cingulate Posterior parietal cortex Ventromedial prefontal cortex	Active when brain is not engaged in specific task Controls areas including introspection, autobiographical memory, and perception of others
Salience network (SN)	Ventrolateral prefrontal cortex Anterior insula Anterior cingulate cortex	Involved with events requiring non-automatic response and switching between the DMN and CEN

Source: Buckner et al[13] and Goulden et al[14]

Cognitive processes[12]

Primarily, the brain's task is to be aware of and to respond to the environment which includes the external physical world, the internal state, and the social world. The brain's work is to perceive the environment, survey it, and

monitor it for changes, which involves cognitive processes devoted to the control, focus, and filtering of sensory information. The brain has to interpret and appraise this sensory input and identify changes occurring in the environment. This process involves memory to compare the present environment with the past environment. The brain must store, retrieve, and process information using both short-term and long-term memory, including sensory memories.

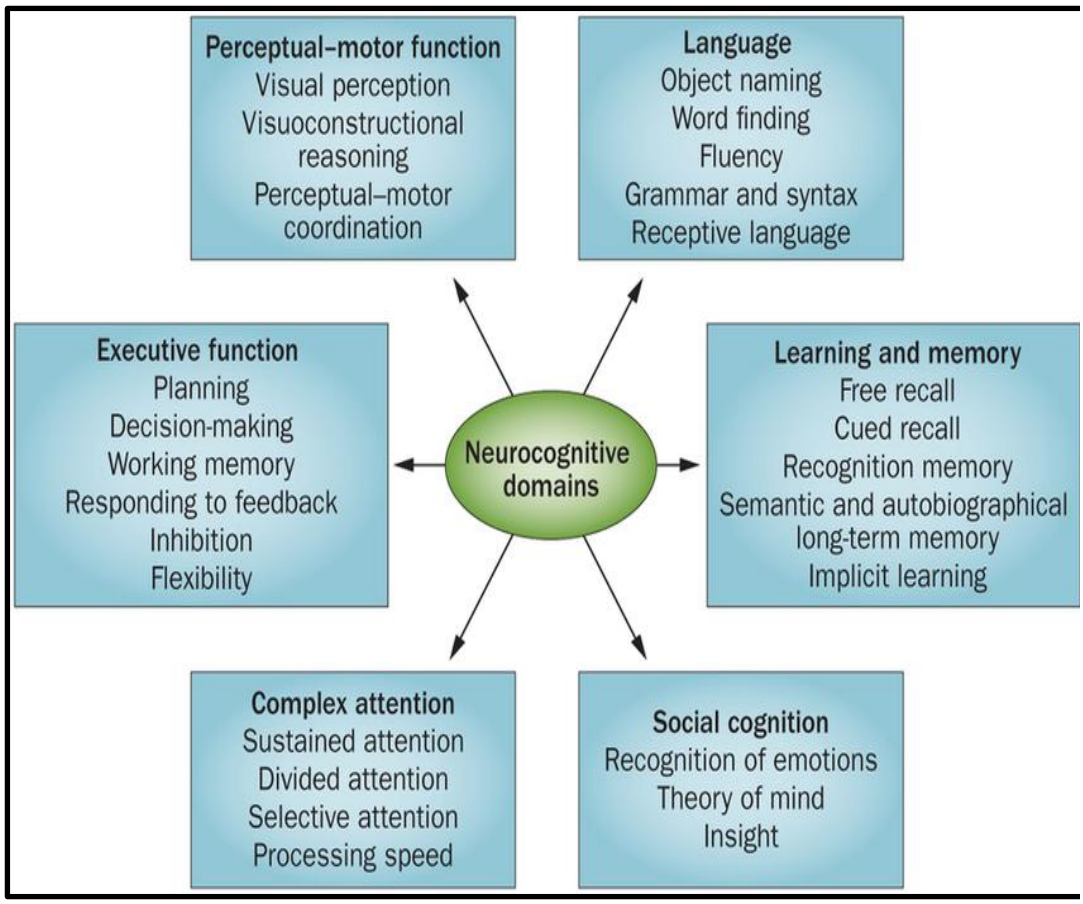
When changes in the environment are perceived, the brain has to evaluate their significance (salience) and prepare responses with the goal of minimizing threats and maximizing rewards. In addition, the brain must maintain an internal representation of other current goals and modulate actions toward their achievement. This cognitive activity has both a mental component and a bodily preparation component. The mental component involves a switch from the DMN, which is engaged when nothing unusual is occurring, to the engagement of the CEN and activation of executive functions. Bodily preparation involves connections from the CEN, SN, DMN, and other cortical and higher brain regions to the basal ganglia, hypothalamus, midbrain, and other regions that enable communication with and control of other organs and body systems.

Neuro-cognitive domains

The DSM-5 defines six key domains of cognitive function (Figure 1), and each of these has subdomains. Identifying the domains and subdomains affected in a particular patient can help establish the aetiology and severity of the

neurocognitive disorder. Objective assessments are essential, but the DSM-5 does not name any proprietary tests[15]

Figure 1. Six neurocognitive domains[15]



Factors affecting cognition

Cognitive factors refer to characteristics of the person that affect performance and learning which serve to modulate performance such that it may improve or decline. These factors involve cognitive functions like attention, memory, and reasoning.[16]

Cognitive factors are internal to each person and serve to modulate behaviour and behavioural responses to external stimuli like stress. Performance on various daily living activities has been found to be affected by these factors. Executive functions, for example, have been shown to predict ability to live independently in older adults.[17]

Cognition and diabetes

Type 2 diabetes – *The problem statement*

Diabetes is a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease.[18] According to Wild et al[19] the prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million in 2030 with a maximum increase in India. It is predicted that by 2030 diabetes mellitus may afflict up to 79.4 million individuals in India, while China (42.3 million) and the United States (30.3 million) will also see significant increases in those affected by the disease[19]

Preliminary results from a large community study conducted by the Indian Council of Medical research (ICMR) revealed that a lower proportion of the

population is affected in states of Northern India (Chandigarh 0.12 million, Jharkhand 0.96 million) as compared to Maharashtra (9.2 million) and Tamil Nadu (4.8 million).[20]

The National Urban Survey conducted across the metropolitan cities of India reported similar trend: 11.7 % in Kolkata (Eastern India), 6.1 % in Kashmir Valley (Northern India), 11.6 % in New Delhi (Northern India), and 9.3 % in West India (Mumbai) compared with 13.5 % in Chennai (South India), 16.6 % in Hyderabad (south India), and 12.4 % in Bangalore (South India).[21]

This high prevalence of diabetes in India is multifactorial including genetic, environmental and socio-cultural factors. There are two important differences in the epidemiology of diabetes in India. First, the age of onset of diabetes is a decade lower (20 – 40 year) in India compared to Caucasians (>50 years). Second, obesity is one of the major risk factor for diabetes. In India, though the rates of overweight and obesity is less compared to western population, the prevalence of diabetes is higher. This shows that Indians are more predisposed to diabetes even at lower BMI compared to Europeans.[22]

Higher incidence and prevalence of early-onset of diabetes also explains the development of various microvascular and macrovascular complications due to longer duration of the disease. A recent international study reported that diabetes control in individuals worsened with longer duration of the disease (9.9±5.5 years). [23] Among the complications, neuropathy is the most common (24.6 %) followed by

cardiovascular complications (23.6 %), renal issues (21.1 %), retinopathy (16.6 %) and foot ulcers (5.5 %).[24]

Status of cognition in diabetes

Cognitive dysfunction is the less recognised and least addressed, yet a complication which is now gaining importance. The spectrum of cognitive impairment ranges from mild deficits that are not detected clinically to the most severe clinical form, dementia. Patients with diabetes are approximately 1.5 times more likely to acquire cognitive decline than individuals without diabetes mellitus. In a large cross-sectional study by Gao et al, the authors have stated that the prevalence of mild cognitive impairment (MCI) and dementia in patients with type 2 diabetes mellitus was found to be 13.5 % and 2.34 % respectively.[25] According to 2007 prevalence data from the Centre for Disease Control and Prevention (CDC) in the United States, T2DM affects nearly 24 million people in the United States (US).[25] T2DM disproportionately affects the elderly age group who are at the most risk for cognitive impairment. Almost 25% of the population who are 60 years and older, had T2DM in 2007. It is important to point out that both cognitive impairment and T2DM are disorders that are more common in the elderly.[26] Mukerje et al[27] in their study have shown that the prevalence of cognitive impairment in diabetic population is as high as 42%

Mild Cognitive impairment (MCI) has been used to describe a transitional state between normal cognitive function and Late onset Alzheimer's disease (LOAD) dementia. Individuals with MCI do not have dementia but have memory

complaints without loss of function in their daily activities. Intervention involving earlier detection of MCI is the target for the clinicians to prevent transition from MCI to dementia.

Classic cardiovascular risk factors like hyperlipidaemia, diabetes and hypertension have shown to be associated with the risk of cognitive impairment.[28] Apart from these classical risk factors, additional factors such as gender, lifestyle (physical and mental activity), smoking, alcohol consumption, psychosocial factors (social activity), vitamin D deficiency, testosterone deficiency, and subclinical thyroid have been difficult to identify.

In patients with type 1 diabetes, specific and global deficits involving speed of psychomotor efficiency, information processing, mental flexibility, attention, and visual perception seem to be present, while in patients with type 2 diabetes an increase in memory deficits, a reduction in psychomotor speed, and reduced frontal lobe (executive) functions have been found.[29]

Patients with diabetes also have been found to have slower walking speed, lack of balance, and increased falls associated with type 2 diabetes. Coexisting depression in these patients further complicate the scenario.[30] Glycaemic control appears to play a major role in determining the degree of cognitive dysfunction detected in patients with type 2 diabetes. Impaired glucose tolerance without diabetes is also a risk factor for cognitive dysfunction. Multiple investigations of patients with impaired glucose tolerance have shown them to have lower mini-mental status exam and long-term memory scores.

Table 2 shows the summary of cognitive domains that have been found to be negatively affected by type 1 and type 2 diabetes mellitus[1]

Type 1 diabetes	Type 2 diabetes
Slowing of memory*	**Memory***
Psychomotor efficiency*	• **Verbal memory**
Attention*	• **Visual retention**
Memory	• **Working memory**
Learning	• **Immediate recall**
Problem solving	• **Delayed recall**
Motor speed	**Psychomotor speed***
Vocabulary	**Executive function***
General intelligence	**Processing speed**
Visuoconstruction*	**Complex motor function**
Visual perception	**Verbal fluency**
Somatosensory examination	**Attention**
Motor strength	**Depression**
Mental flexibility*	
Executive function	

*The cognitive domains which are more affected.

Pathophysiology of cognitive impairment in diabetes

The underlying mechanisms of cognitive dysfunction in patients with diabetes is postulated to be because of the combination of four factors.

1. The role of hyperglycaemia
2. The role of vascular disease
3. The role of hypoglycaemia
4. The role of insulin resistance and amyloid.

The mechanisms are pictorially explained in the figure 3.

1. The role of hyperglycaemia

The mechanisms by which hyperglycaemia induce the changes in cognitive function may be the same as how it affects the other organs, viz, polyol pathway activation, increased formation of advanced glycation end products (AGEs), diacylglycerol activation of protein kinase C, and increased glucose shunting in the hexosamine pathway.[31] Animal studies have explained that AGE and receptors for AGE are increasingly expressed in cognitive impairment. But human autopsy studies are very limited and have given inconsistent results. Hyperglycemia causes increase in reactive oxygen species, particularly superoxide, which lead to increased polyol pathway activation and formation of AGEs, activation of protein kinase C, and glucose shunting in the hexosamine pathway which ultimately results

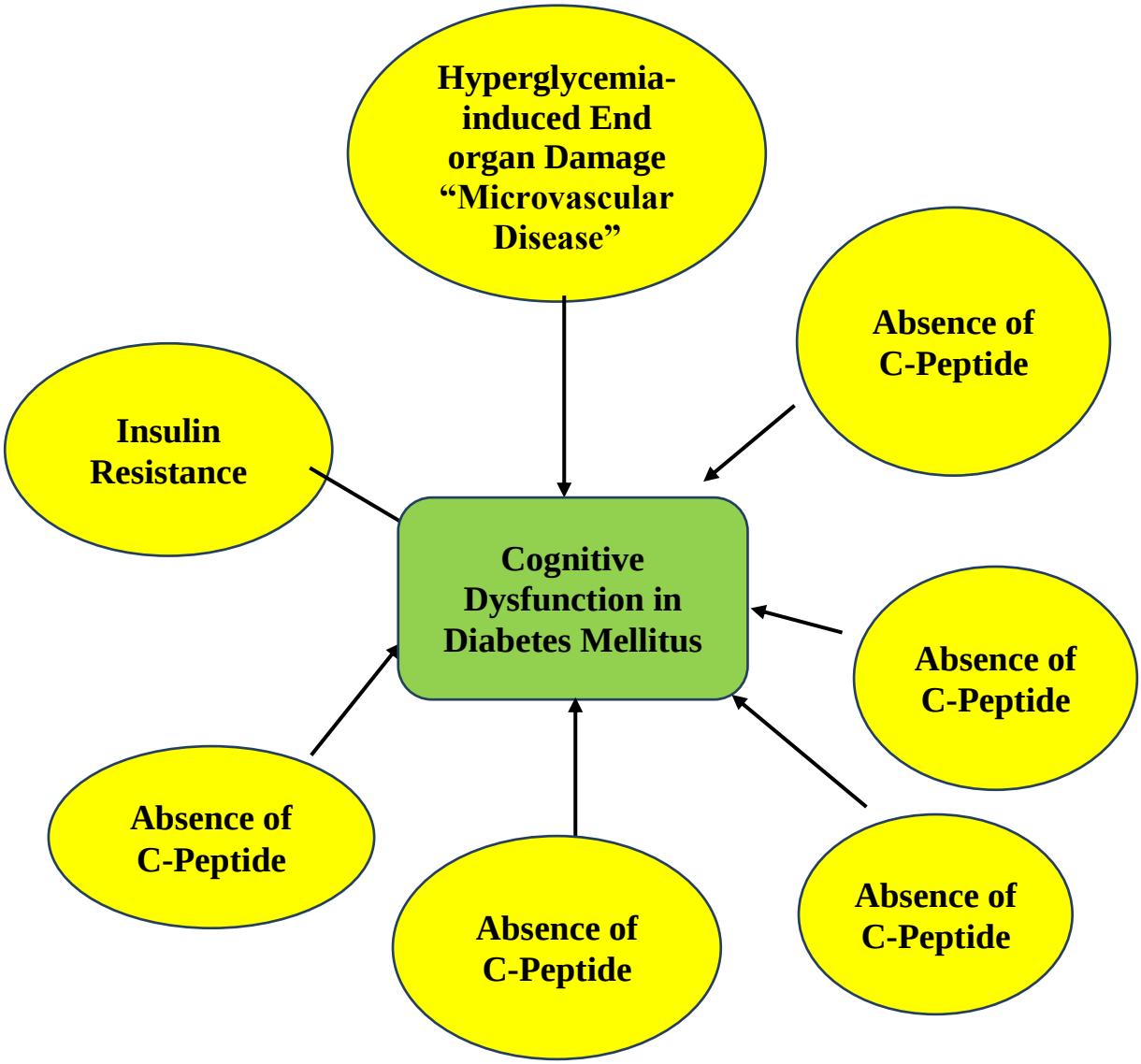
end organ damage and neuronal damage.[31] Altered neurotransmitter function has also been documented in diabetic models in addition to hyperglycaemia-induced end organ damage. The neurotransmitter N-methyl-D-aspartate (NMDA) which is involved in long-term potentiation and learning may be affected. Other changes in neurotransmitters may be decreased acetylcholine, decreased serotonin turnover, decreased dopamine and increased norepinephrine.[1]

2. Role of vascular disease

Patients with diabetes have a two to six-fold increased risk of thrombotic stroke. Autopsy changes related to vascular disease has proved diffuse brain degeneration, pseudocalcinosis, neve fibrosis, demyelination of cranial nerves and spinal cord.[32,33] In addition to the thickening of capillary basement membrane, which is the hallmark of microangiopathy, coexistence of ischemia and hyperglycemia may be particularly detrimental to the brain.[34] Even mild elevation in blood glucose levels (greater than 8.6 mmol/liter) in humans during a cerebrovascular event correlates with poorer clinical recovery.[35] One potential mechanism through which hyperglycemia could mediate ischemic damage is lactate accumulation. Hyperglycemia provides more substrate for lactate formation which leads to cellular acidosis and worsening of injury. Another mechanism is the glutamate accumulation in the setting of hyperglycemia and ischemia.[1] Glutamate, an excitatory

amino acid neurotransmitter, has been shown to cause neuronal damage in the brain.[36]

Figure 2. Pathophysiological mechanisms linking cognition and diabetes[1].



3. Role of hypoglycaemia

There are no general consensus regarding the contribution of hypoglycaemia in cognitive impairment and it is said to be controversial. In a study by Patrick et al[37] they have found that the cortex, basal ganglia, and hippocampus appear to be most vulnerable to hypoglycaemia. Laminar necrosis and gliosis have been seen in these regions on autopsies performed in human patients who died of hypoglycaemia. In animal models, hypoglycaemia-induced neuronal damage seems to be selective to neurons with sparing of astrocytes and oligodendrocytes.[38] There may also be a relationship to hypoglycemia during early nocturnal sleep, during which consolidation of memories occurs, and hence are prone to cognitive dysfunction. When compared to euglycemic clamping during sleep, hypoglycemic clamping in subjects with type 1 diabetes have resulted in impaired declarative memory.[39]

4. The role of Insulin resistance and amyloid

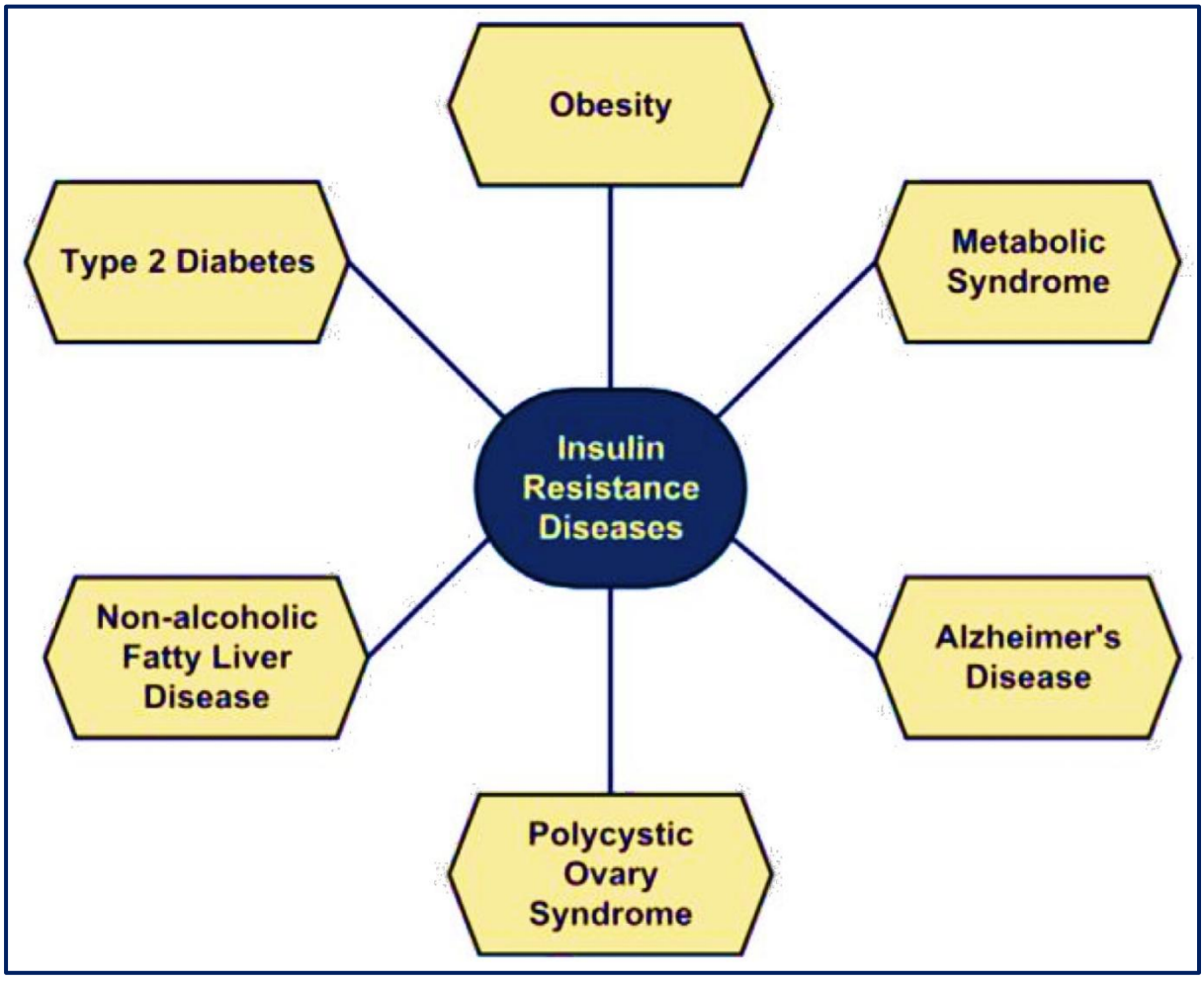
Like any other organ systems in our body, the brain requires insulin and IGF to maintain energy metabolism, cell survival, and homeostasis. In addition, insulin and IGFs support neuronal plasticity and cholinergic functions, which are needed for learning, memory, and myelin maintenance. Impairments in insulin and IGF signalling due to receptor resistance or ligand deficiency, disrupt energy balance and disable networks which support a broad range of brain functions[2]. Evidence shows that impairment in brain insulin and IGF signalling mediates cognitive

dysfunction and neurodegeneration that result in mild cognitive impairment and Alzheimer disease (AD). Though the fact that amyloid deposits and phospho-tau–associated neuronal cytoskeletal lesions account for some AD-associated brain abnormalities, they are not well-documented deficits in brain metabolism in the very early stage of the disease. Metabolic derangements seen in AD are similar to those in both type 1 type and 2 diabetes mellitus.

The deficits in signalling through progrowth, proplasticity, and prosurvival pathways are the consequences of insulin/IGF receptor resistance and ligand deficiency seen in cognitive impairment and neurodegeneration.[2] Such insulin resistance states are found in many other peripheral diseases like obesity, type 2 diabetes mellitus, non-alcoholic fatty liver disease (NAFLD) and metabolic syndrome (Figure 3)

One of the working hypothesis is to relate the brain insulin resistance with peripheral insulin resistance that seem to exacerbates cognitive impairment and neurodegeneration. Increased inflammation, cytotoxic lipid production, oxidative and endoplasmic reticulum (ER) stress, and worsening of insulin resistance are because of the consequences of insulin resistance with dysregulated lipid metabolism

Figure 3. Spectrum of insulin-resistance diseases.



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Assessment of cognitive dysfunction in patients with type 2 diabetes

Cognition has been added to some standards of diabetic care, with practice recommendations to perform cognitive screening or ongoing cognitive assessment in the context of glycemic control or poor diabetes self-management.[40] The table 3 represents the different modalities of assessing cognitive functions in a clinical setup.

TABLE 3. Modalities for assessment of cognitive dysfunction in diabetes

Neurocognitive testing
Evoked response potentials
EEG
MRI
fMRI
SPECT
PET

Neurocognitive testing

Neurocognitive tests are most commonly done in clinical set-up. In testing, the examiner administers a battery of tests to assess different aspects of cerebral function. This has been the gold standard for the assessment of neurocognitive function. Neurocognitive tests have been very useful in assessing neurocognition in a variety of diseases, including diabetes, though it is cumbersome to administer and score. Table 4 shows the list of commonly used neurocognitive tests.

Table 4. Neurocognitive tests

Cognitive test	Hypothesized domain
Mini-mental state examination	Orientation, registration, short-term memory and language.
Logical memory I and II	Episodic memory
Immediate story recall	
Delayed story recall	
Word list memory	
Word list recall	
Word list recognition	
Boston name testing	Semantic memory
Category verbal fluency	
Digit span forward	Working memory
Digit span backward	
Digit ordering	
Symbol digit modalities test	Perceptual speed
Number comparison	
Stroop colour naming	
Stroop word reading	
Judgement of line orientation	Visuospatial ability
Standard progressive matrices	

Mini Mental State Examination

The Mini-Mental State Exam (MMSE) or Folstein test is a 30-point questionnaire that is widely used for assessing cognitive function. The MMSE was first published in 1975 as an appendix to an article written by Marshal F. Folstein, Susan Folstein, and Paul R. McHugh.[41] It was published in Volume 12 of the Journal of Psychiatric Research, published by Pergamon Press.

It is used as a screening test for dementia in clinical practice. It is also used to estimate to follow the course of cognitive changes over time and to assess the severity and progression of cognitive impairment. Administration of the test takes between 5 and 10 minutes and it includes five components of cognition, viz, assessment of orientation, attention, memory, language and visual-spatial skills.

Advantages of MMSE

Advantage of MMSE is that it requires no specialized equipment or training for administration. It has both validity and reliability for the diagnosis and longitudinal assessment of Alzheimer's Disease. Due to its short administration period and ease of use, it is useful for cognitive assessment in the OPD or bedside.

Disadvantages of MMSE

Disadvantages to the utilization of the MMSE is that it is affected by various demographic factors like age and gender. Education and occupation exert the greatest effect. The most frequently noted disadvantage of the MMSE is its lack of sensitivity to mild cognitive impairment. It also fails to adequately discriminate

patients with mild Alzheimer's Disease from normal patients. The content of the MMSE is highly verbal, lacking sufficient items to adequately measure visuospatial and/or constructional praxis.

MMSE is also insensitive to impairments in executive functioning, abstract reasoning, and visual perception/construction. Moreover, false-positive errors might be more common among patients with less education and of lower socioeconomic status. A ceiling effect might be seen in patients with a high level of education and patients with MCI, because of the low level of item difficulty. Furthermore, some items in the MMSE were difficult to translate into another language, so they have been adjusted to adapt to the culture of each country[42]

Validity and reliability of MMSE

The test-retest reliability (0.80–0.95) for MMSE seems to be good and the sensitivity and specificity is acceptable to detect mild to moderate stages of dementia.[41,43,44] Examination of its psychometric properties shows moderate-to-high levels of reliability, with test-retest reliability higher than the measures of internal consistency. Items measuring recall of three words, copy pentagon, 7s/WORLD, and orientation to time appear to be the most sensitive to both normal ageing and demanding illnesses. Criterion validity measures show high levels of sensitivity for moderate-to-sever levels of dementia. Construct validation studies demonstrate that MMSE scores correlate highly with those obtained from other types of cognitive screening tests.[43]

Scoring and interpretation of MMSE[45]

The MMSE assesses the cognition of the patients with respect to orientation, registration, attention and calculation, recall, and language and praxis.

Orientation (10 points)

- The patient is asked for the date and then specifically for parts omitted (e.g., "Can you also tell me what season it is?"). One point for each correct answer.
- The patient is asked in turn, "Can you tell me the name of this hospital (town, county, etc.)?" One point for each correct answer.

Registration (3 points)

- The patient is asked to say the names of three unrelated objects clearly and slowly, allowing approximately one second for each. After the instructor has said all three, the patient is asked to repeat them. The number of objects the patient names correctly upon the first repetition determines the score (0-3). If the patient does not repeat all three objects the first time, continue saying the names until the patient is able to repeat all three items, up to six trials. The number of trials taken by the patient to learn the words is recorded. If the patient does not eventually learn all three, recall cannot be meaningfully tested.

- After completing this task, the patient is told, "Try to remember the words, as I will ask for them in a little while."

Attention and Calculation (5 points)

- The patient is asked to begin with 100 and count backward by sevens. He is stopped after five subtractions.[93,86,79,72,65] The total number of correct answers is scored.
- If the patient cannot or will not perform the subtraction task, the patient is asked to spell the word "world" backwards. The score is the number of letters in correct order (e.g., dlrow=5, dlorw=3).

Recall (3 points)

- The patient is asked if he or she can recall the three words that the instructor has previously asked him or her to remember. The total numbers of correct answers were recorded (0-3).

Language and Praxis (9 points)

- **Naming:** The patient is shown a wrist watch and asked what it is. The same is repeated with a pencil. One point is scored for each correct naming (0-2).

- **Repetition:** The patient to asked to repeat the sentence after the instructor ("No ifs, ands, or buts."). Only one trial is allowed. Score 0 or 1.

- **3-Stage Command:** The patient is given a piece of blank paper and instructed, "Take this paper in your right hand, fold it in half, and put it on the floor." One point is scored for each part of the command correctly executed.

- **Reading:** On a blank piece of paper the sentence, "Close your eyes," in letters is printed or written large enough for the patient to see clearly. The patient is asked to read the sentence and do what it says. One point is scored only if the patient actually closes his or her eyes. This is not a test of memory, so the instructor may prompt the patient to "do what it says" after the patient reads the sentence.

- **Writing:** The patients are given a blank piece of paper and ask him or her to write a sentence for you. The sentence should not be dictated; it should be written spontaneously. The sentence must contain a subject and a verb and make sense. Correct grammar and punctuation are not necessary.

- **Copying:** The patient is shown the picture of two intersecting pentagons and asked to copy the figure exactly as it is. All ten angles must be present and two must intersect to score one point. Tremor and rotation are ignored.

Interpretation of MMSE

The table 5 shows the interpretation of MMSE scores

Table 5. Interpretation of MMSE[45]

Method	Score	Interpretation
Single cut-off	<24	Abnormal
Range	<21	Increased odds of dementia
	>25	Decreased odds of dementia
Education	21	Abnormal for 8th grade education
	<23	Abnormal for high school education
	<24	Abnormal for college education
Severity	24 – 30	No cognitive impairment
	18 – 23	Mild cognitive impairment
	0 -17	Severe cognitive impairment

Other tests to assess cognitive function

Evoked Response Potentials

These are useful to detect sensory/ perception deficits. In a study involving type 1 and type 2 diabetes, slowed latency of visual, somatosensory, and brainstem auditory-evoked potential patients is seen with type 2 diabetes whereas only slowed

latency of visual and somatosensory-evoked potentials was observed in patients with type 1 diabetes[3]

Electroencephalogram (EEG)

EEG can also assess spontaneous cerebral electrical activity and has been used in patients with type 1 and type 2 diabetes. In patients with type 2 diabetes, it has has been found to have slowing in the EEG frequency band analysis over the central cortex area and reduction of alpha activity over the parietal area[4]

Magnetic resonance imaging (MRI)

White matter hyperintensities have been noticed to correlate with reduced performance on tests of attention, executive function, information processing speed, and memory in patients with type 2 diabetes. Researchers have hypothesized that White matter hyperintensities could represent demyelination, increased water content, angionecrosis, cystic infarcts, or gliosis.[5] Hippocampal and amygdala atrophy has also been demonstrated in subjects with type 2 diabetes by MRI[6]

Functional MRI (fMRI)

Functional MRI (fMRI) has also been used to assess cerebral function in patients with diabetes. The principle of fMRI is based on increase in cerebral blood flow and metabolism during stimulus-induced neuronal activation. It is also accompanied by a relative reduction in deoxyhemoglobin content of the activated tissue which is a paramagnetic molecule, that can be pictured by MRI.[4] Rosenthal et al[7] utilised fMRI to the study of cerebral function during standard neurocognitive testing in

subjects with type 1 diabetes who were subjected to both euglycemia and hypoglycemia. It was found from their study that the effect of acute hypoglycemia on cerebral blood flow is task and region specific. For example, during hypoglycemia, the slower finger tapping corresponded to decreased activation of the right premotor cortex, supplementary motor area, and left hippocampus and with increased activation in the left cerebellum and right frontal pole. In addition, during hypoglycemia deterioration of four-choice reaction time correlated with reduced activation in the motor and visual systems but with increased activation of the part of the parietal cortex involved in planning[7].

SPECT and PET

There has been growing utility of SPECT, PET, and diffusion tensor imaging in monitoring or detecting changes cognitive dysfunction in patients with diabetes.[4] Cerebral perfusion can be assessed accurately using SPECT. It has been demonstrated in patients with type 2 diabetes and dementia, higher incidence of hypoperfusion is observed in at least one area of the brain. PET with fluorodeoxyglucose is a technique that is based on glucose metabolism where the compound is taken up and trapped in the cell by phosphorylation.[4] The studies done on the utilisation of PET scan on diabetes are very less and are with inconsistent results.

Reaction Time

Simple reaction time (SRT) tests are a measure of processing speed, where

subjects simply respond as fast as possible to a stimulus. SRTs were first studied by Francis Galton in the late 19th century.[8] Significant correlations between SRT latencies of processing speed and measures of fluid intelligence have been stated in many recent studies.[46,47]

The effects of factors that have been found to significantly influence SRT like age, sex, and education has been analyzed in detail using computer-based paradigm.

Auditory and visual reaction time is considered as an ideal tool for measuring sensory motor association.[11] Reaction time (RT), is the time between the application of a stimulus which can be of any sensory modality like visual, auditory, pain, touch or temperature and the behavioral response. It is a good index of processing speed of CNS. The behavioral response is typically a button press but can also be an eye movement, a vocal response, or some other observable behavior.[12]

Apart from being an index of processing speed, reaction time is also used to measure the ability in processing information and in judging the ability to concentrate and coordinate.[13, 14]

Types of reaction time

There are 3 different types of reaction time experiments, simple, recognition, and choice reaction time experiments. In simple reaction time experiments, there is only one stimulus and one response. In recognition reaction time experiments, there

are some stimuli (the "memory set") that should be responded to and others (the "distracter set") that should not be responded to. In choice reaction time experiments, there are multiple stimuli and multiple responses and subject must give a response that corresponds to the stimulus. It was reported that the time for motor preparation (e.g., tensing muscles) and motor response was the same in all three types of reaction time tests, implying that the differences in reaction time are due to processing time[15]

Normal reaction time

Average Reaction Time for human is as follows

1. Visual RT - 0.25 seconds
2. Auditory RT - 0.17 seconds
3. Somatosensory RT - 0.15 seconds

Auditory stimulus takes only 8-10 ms to reach brain. But visual stimuli take 20-40ms. Therefore, auditory stimuli reach the cortex faster than the visual stimulus.

Factors affecting reaction time

Factors that can affect the average human RT include age, sex, left or right hand, central versus peripheral vision, practice, fatigue, fasting, breathing cycle, personality types, exercise, and intelligence of the subject.[16]

Reaction time apparatus

RT apparatus is a simple circuitry which has two sides – examiner side (E) and subject side (S). There are 5 keys on the Examiners (E) side. Keys for Red light, green light, sound, click and touch. By pressing a key, the respective stimulus can be presented to the Subject (S). On the S side, there are two keys and a light box. By releasing the key connected with the stimulus, the S has to respond. In between the S keys and E keys, there is a metallic screen, so that S may not see which key will be pressed to present the stimulus.

Picture of reaction time analyser

Aims and Objectives

AIM OF THE STUDY

This study is aimed to assess the cognitive functions and its correlates in patients with type 2 diabetes mellitus

OBJECTIVES OF THE STUDY

1. To assess cognition by Mini-mental State Examination (MMSE) in patients with type 2 diabetes mellitus
2. To measure the visual and auditory reaction time in patients with type 2 diabetes mellitus
3. To compare and correlate the scores of MMSE and audio-visual reaction time with duration of diabetes, glycemic index, gender, BMI, life style factors, smoking, alcohol and literacy level of the study participants.

Materials and Methods

MATERIALS AND METHODS

- **Type of study** : Cross-sectional, Prevalence study.
- **Place of study** : OPD and IPD, Department of Medicine, Dhanalakshmi Srinivasan Medical College Hospital, Perambalur.
- Clearance from Institutional Ethics Committee has been obtained **[Annexure 1]**
- **Duration of study**: From January 2016 to May 2017
    - Collection of data : 12 months
    - Analysis of data : 2 months
    - Drafting of report : 4 months
- **Reference population** : Patients with type 2 diabetes mellitus.
- **Source population** : Type 2 Diabetic patients attending OPD & IPD of DSMCH.
- **Sample size** : 376 patients
- **Sampling method** : Simple random sampling method following inclusion and exclusion criteria.
- **Sample size estimation:**

    Using previous literature,[3,27] with the prevalence rate of 42%, and confidence level of 95% (5% confidence limit) and a design effect of 1, the sample size was calculated as 376.

Sample Selection criteria

Inclusion criteria

1. All patients with type 2 diabetes mellitus aged 30 to 60 years attending OPD and IPD of DSMCH who had given written consent to participate in the study.

Exclusion criteria

1. Patients with auditory, visual and speech problems
2. Patients on antidepressants, antipsychotics and sedatives
3. Patients with neuromuscular disorders
4. Patients with history of head injury, epilepsy and Cerebro-vascular accidents
5. Patients with localised pathology/ injury of upper limbs
6. Patients on diabetic emergencies.
7. Non-willing patients

Method of data collection

After explaining about the need and the procedures involved in the study and getting written consent **[Annexure 2]**, the study participants will be subjected to the following.

1. All the patients' demographic profile including age, gender, education, occupation and detailed history regarding life style factors like smoking, alcohol, physical activity pattern and diet habits, duration of diabetes and family history of diabetes and other co-morbid illnesses are documented

and grading given according to the rubric given in the Tamilnadu Health System Project **[Annexure 3].** History of claudicating pain, Peripheral vascular disease, Chronic kidney disease, liver disease, trauma/head injury, stroke/Transient ischemic attack, epilepsy, neuromuscular disorder, chronic intake of sedatives, antidepressants, antipsychotics, hypothyroidism and other audio-visual pathologies are carefully elicited.

2. General and systemic examination including cardiovascular system, Respiratory system, Central nervous system and abdomen are done.
3. Recording of BP and Pulse rate; Anthropometric measurements like height, weight, waist circumference and BMI were done.
4. Cognitive function was assessed using Mini mental state examination (MMSE) **[Annexure 4]**
5. Visual and auditory reaction time was estimated using the apparatus "Reaction time analyser: 501-004-TR (Psychotronics, Bangalore)
6. Glycaemic status was assessed by estimating HbA_1C levels, fasting and post-prandial blood sugar levels.
    a. HbA_1C estimation is done by immune-turibidometry method.
    b. Fasting and post-prandial blood glucose estimation is done by glucose oxidase-peroxidase method.

Data entry

The various categorical and continuous data are entered in Excel spread sheet.

Statistical analysis

Analysis of the data was done using SPSS software 17.0. Normality of the data is checked by Kolmogorov-Smirnov test. The table 6 shows the type of statistical test used for the analysis of various study parameters

Table 6. Statistical tests used for analysis of parameters.

Parameters	Statistical test used
Age	Percentage analysis
Gender	Percentage analysis
Prevalence of cognitive dysfunction	Percentage analysis
Glycemic status and MMSE scores	Spearman Correlation test
Glycemic status and audio-visual Reaction Time	Pearson Correlation test
MMSE and Duration of diabetes and literacy	Kruskal-Wallis test
Audio-visual Reaction Time and Duration of diabetes and Literacy	One way ANOVA
MMSE and gender, diet, physical activity, smoking, alcohol	Mann-Whitney U test
Audio-visual Reaction Time and gender, diet, physical activity, smoking, alcohol	Student's unpaired t test

A p value of < 0.05 at 95% confidence interval was considered to be significant.

Results

RESULTS

Cognitive assessment was done in 376 patients with type 2 diabetes mellitus of both gender, by MMSE and audio-visual reaction time.

Table 7 shows the demographic and life-style characteristics of the study population. Age is represented as mean ± SD, whereas the other categorical variables Gender (Figure 4), smoking habit (figure 5), alcoholism (figure 6), Physical activity (Figure 7) and Diet (figure 8) and are represented as proportions.

Figure 4. Gender distribution of study participants

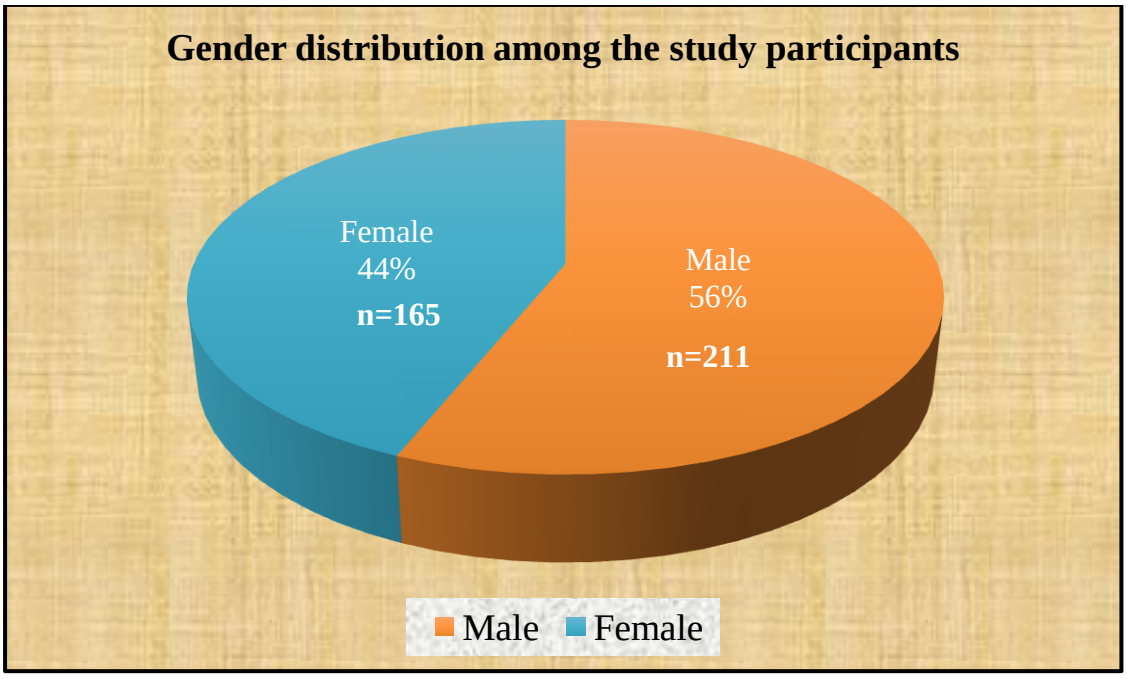


Table 7. Demographic and Life-style characteristics of study population

Parameters	
Age **(**Mean ± SD)	51.47 ± 8.04
Gender, number (percentage)	
Males	211 (56.1)
Females	165 (43.9)
Smoking, number (percentage)	
Smokers	75 (19.9)
Non-smokers	301 (80.1)
Alcoholism, number (percentage)	
Alcoholics	143 (38)
Non-alcoholics	233 (62)
Physical activity, number (percentage)	
Actively involved	91 (24.2)
Not involved	285 (75.8)
Diet, number (percentage)	
Mixed diet	352 (93.6)
Vegetarian	23 (6.1)

Figure 5. Distribution of study participants based on the habit of smoking.

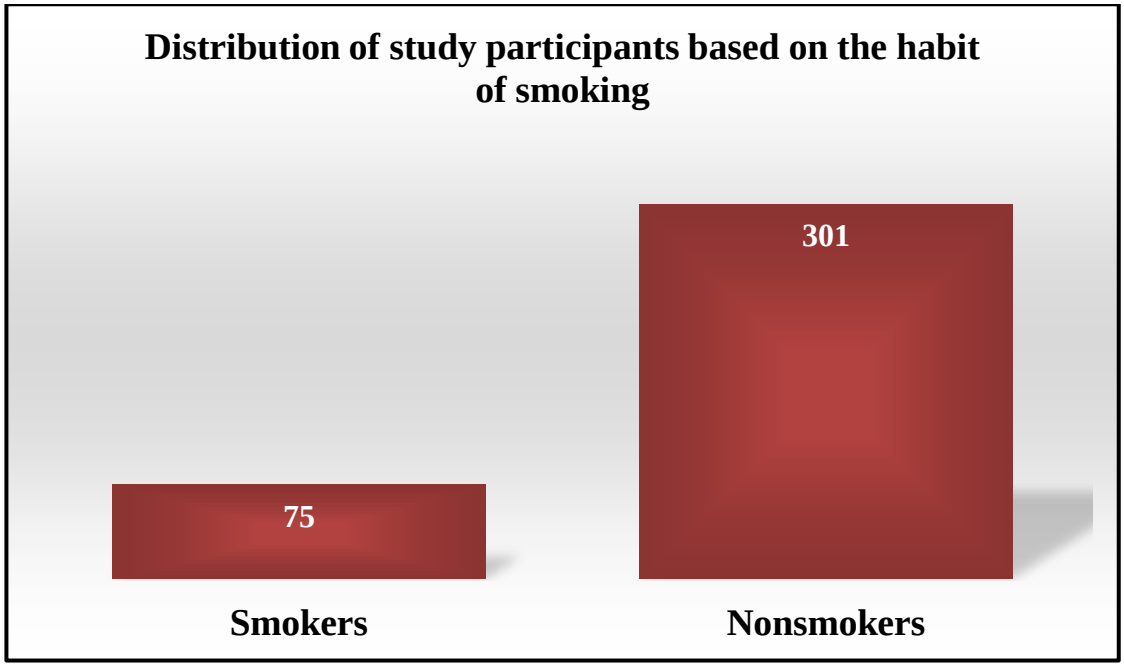


Figure 6. Distribution of participants based on the habit of alcoholism

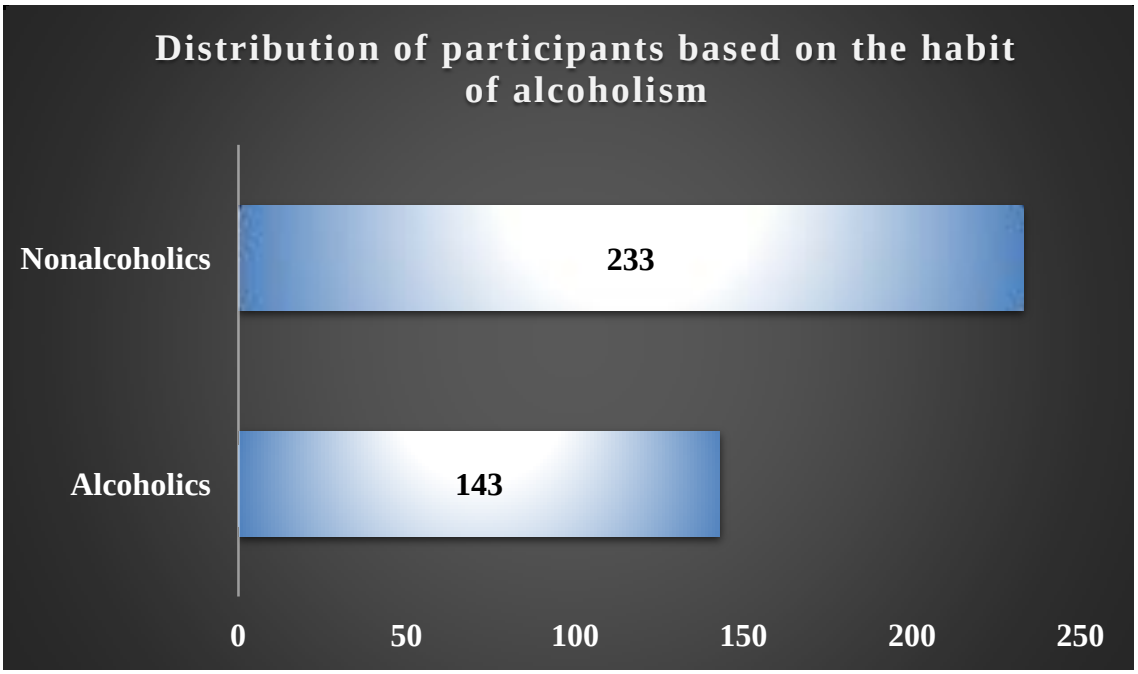


Figure 7. Distribution of participants based on the physical activity

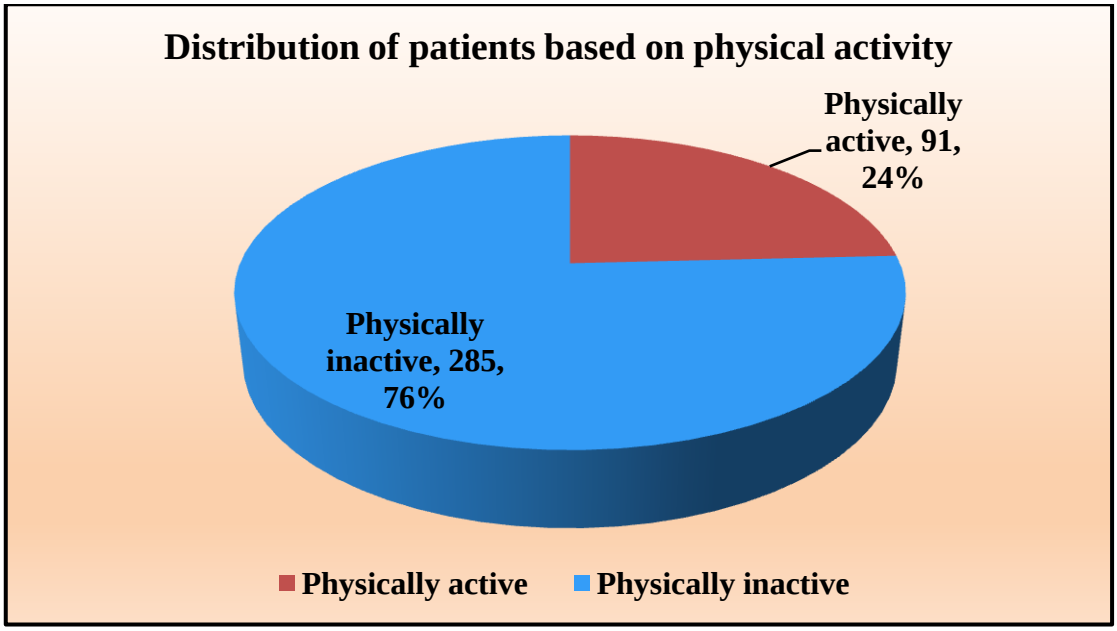


Figure 8. Distribution of study participants based on diet.

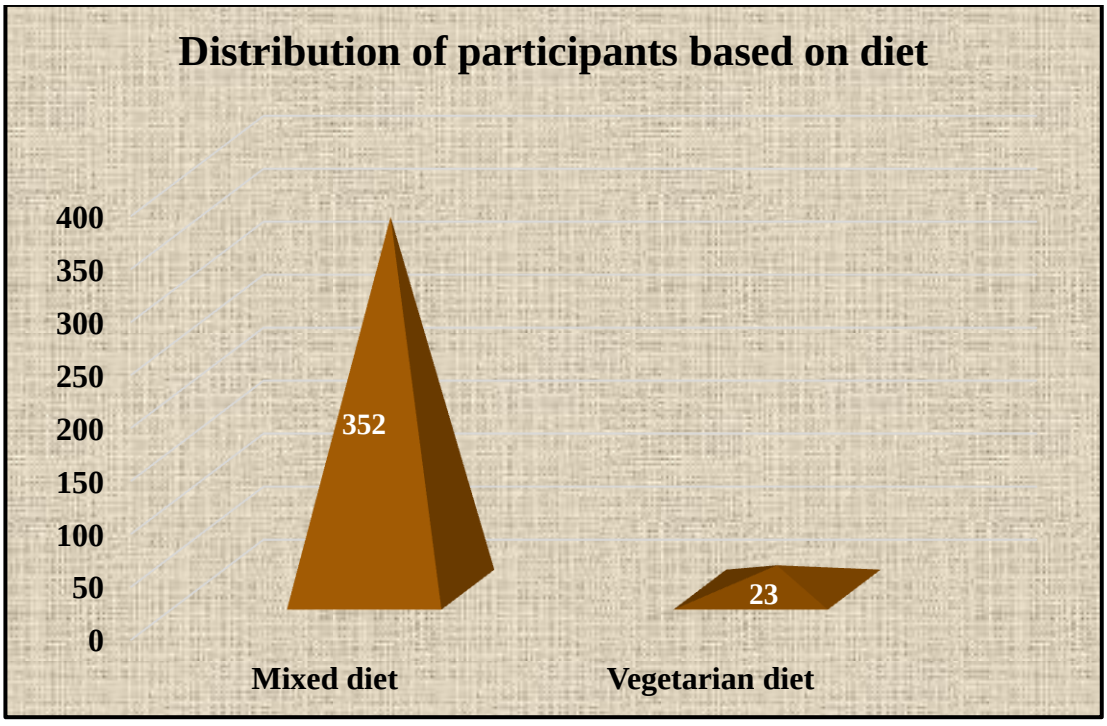


Table 8 shows the frequency distribution of diabetic patients graded based on literacy level. The rubric for literacy level is based on the questionnaire developed by the Tamilnadu Health System Project.

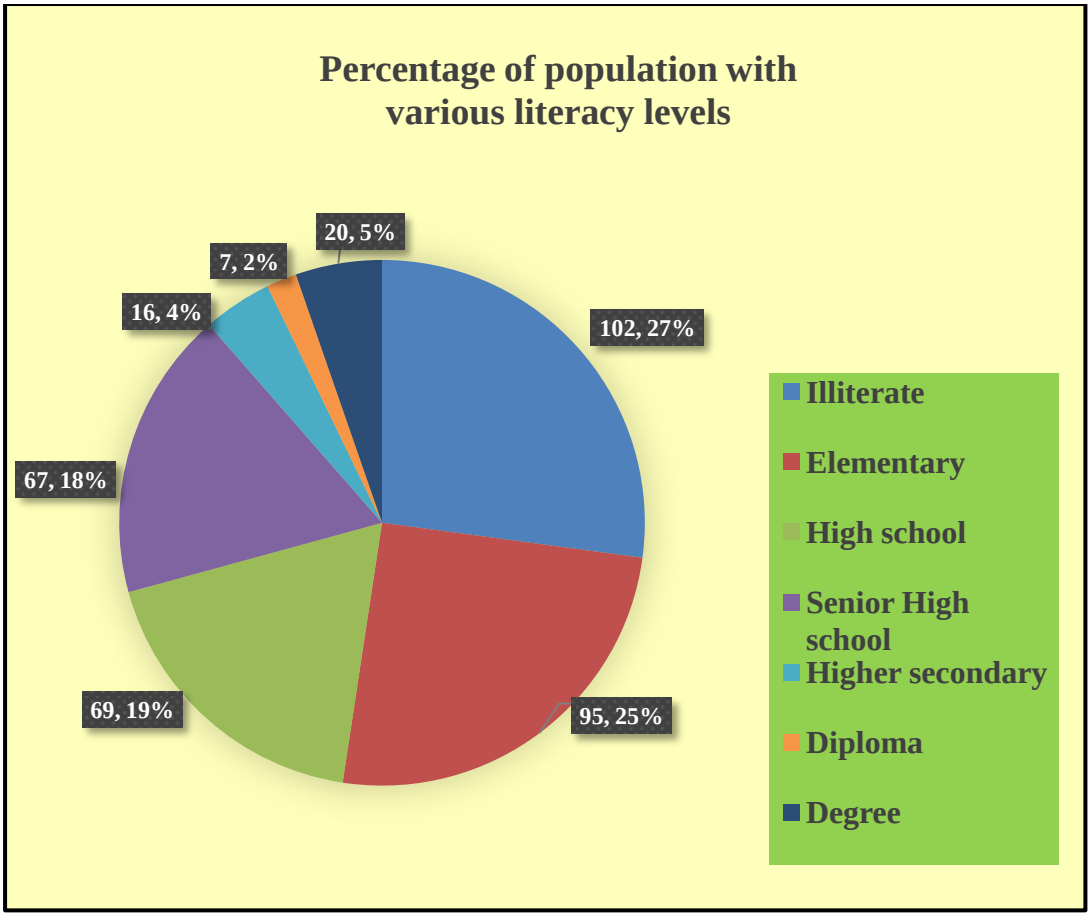
Figure 9 shows the percentage distribution of study population based on the level of literacy as a pie chart.

Table 8. Frequency statistics of the study participants based on level of literacy.

Level of literacy	**Number (percentage)**
Illiterate	102 (27.1)
Elementary	95 (25.3)
High school	69 (18.4)
Senior High school	67 (17.8)
Higher secondary	16 (4.3)
Diploma	7 (1.8)
Degree	20 (5.3)

The classification of literacy level is based on the rubric developed by Tamilnadu health system project.

Figure 9. Percentage of study population with various literacy levels



The distribution is represented in numbers, and percentage.

Table 9 shows the anthropometric and vital signs at resting state of the study population. All the values are represented as mean ± SD. The figure 10 represents the same as a bar diagram.

Table 9. Anthropometric measurements and vital signs of study population

Parameters	**Mean ± SD**
Height (in meters)	1.813 ± 0.39
Weight (in Kilograms)	60.57 ± 11.7
BMI	24.328 ± 4.54
Waist circumference (in centimetres)	89.92 ± 10.92
Systolic BP (in mm Hg)	127.15 ± 15.96
Diastolic BP (in mm Hg)	78.90 ± 8.59
Pulse rate (in beats per minute)	81.95 ± 8.35

Figure 10. Anthropometric values of the study participants

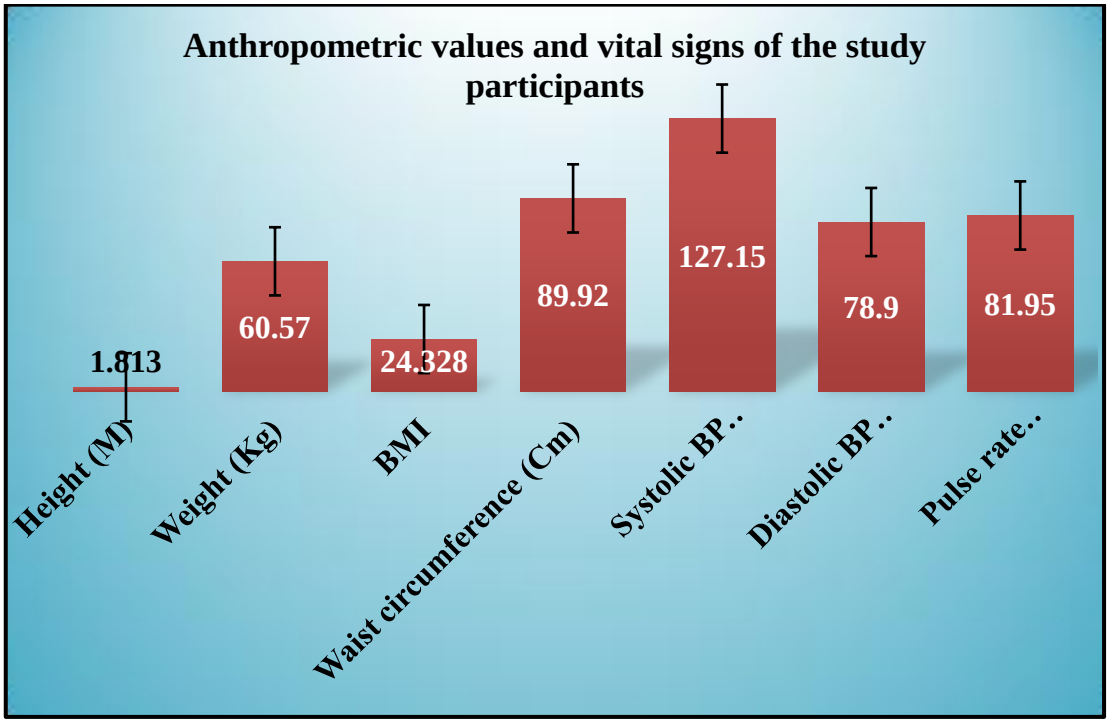


Table 10 and figure 11 shows the mean values of glycaemic indicators ie. HbA_1C, Fasting and postprandial blood sugar levels.

Table 10. Glycaemic indicators of the study population

Parameters	Mean ± SD
Hb A_1C	8.35 ± 1.60
FBS (mm Hg)	185.76 ± 63.49
PPBS ((mm Hg)	273.63 ± 93.32

FBS – Fasting blood sugar; PPBS – Postprandial blood sugar; HbA_1C – Haemoglobin A_1C

Figure 11. Glycaemic indicators of the study population

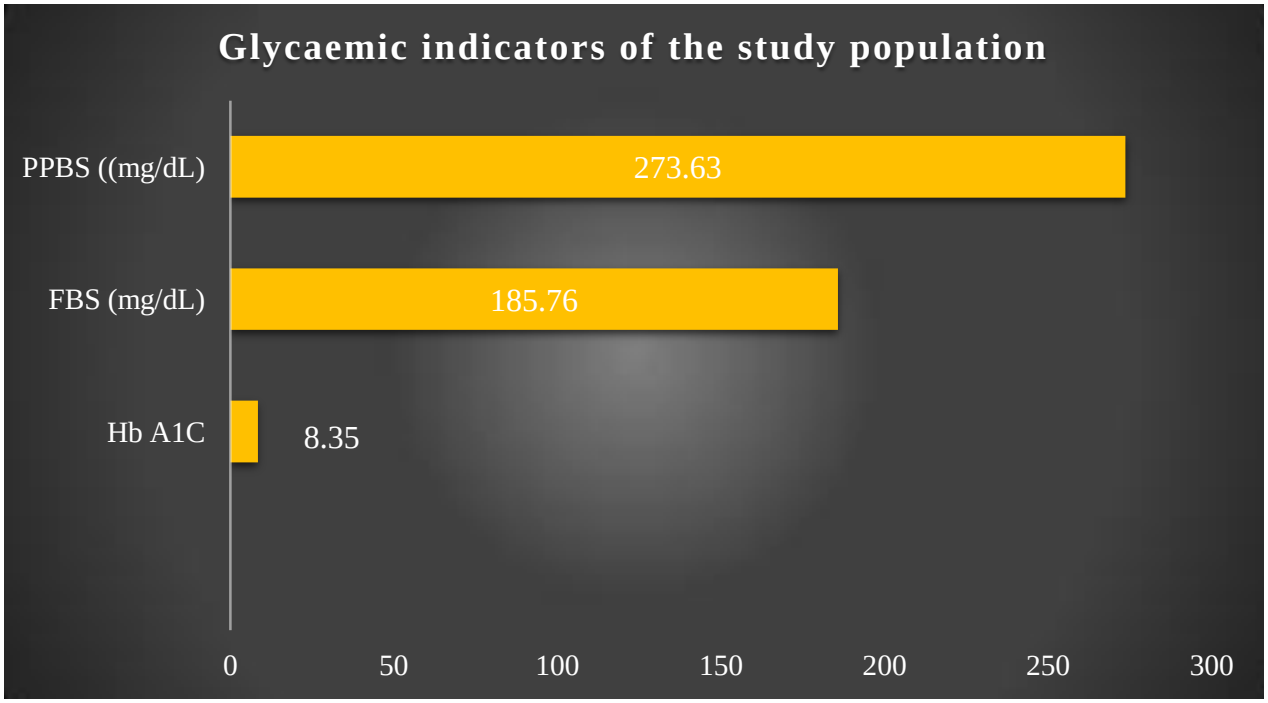


Table 11 shows the values of various cognitive function tests done in this study. MMSE score, being a non-parametric variable is represented as median with range whereas visual and auditory reaction time is represented as mean with standard deviation. Figure 12 depicts the same.

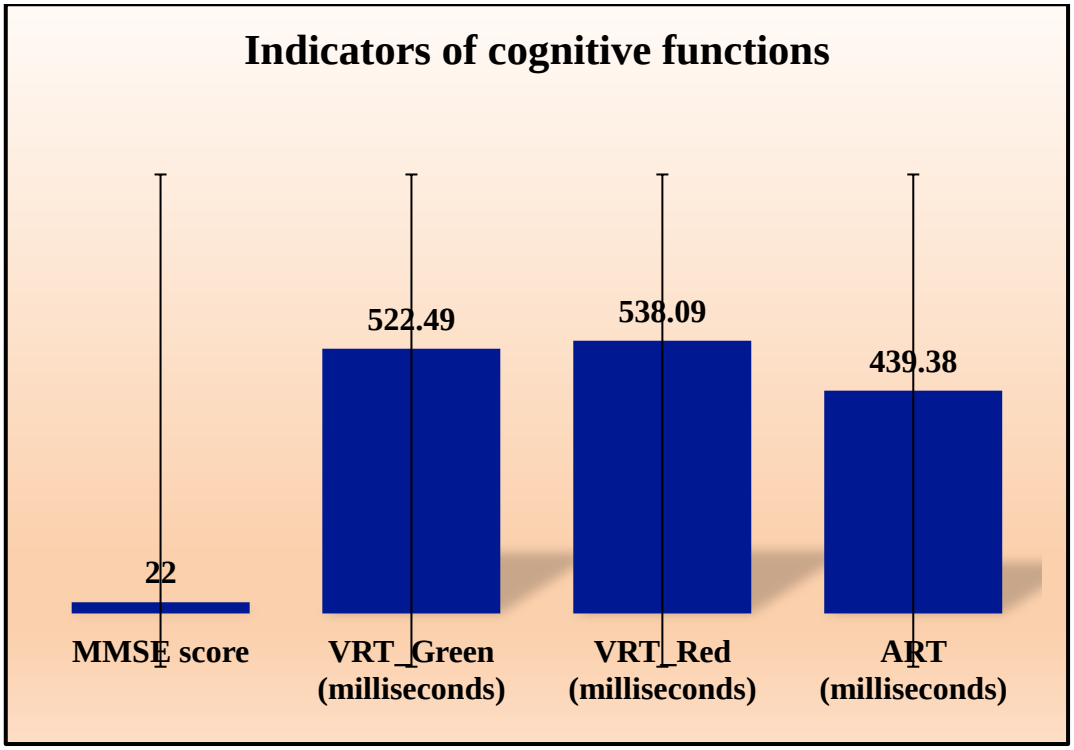
Table.11. Indicators of cognitive function

Parameters	**Mean ± SD**
MMSE score	22 (10 -30) *
VRT_Green (milliseconds)	522.49 ± 198.88
VRT_Red (milliseconds)	538.09 ± 194.27
ART (milliseconds)	439.38 ± 174.31

*MMSE scores are given as median (Range).

VRT_Green, VRT_Red and ART are expressed as mean ± SD.VRT_Green – Visual reaction time for green light, VRT_Red - Visual reaction time for red light, ART – Auditory reaction time.

Figure 12. Indicators of cognitive functions



Prevalence of cognition is calculated using MMSE scores. Table 12 depicts the prevalence of cognitive impairment based on MMSE scores.

Table 12. Prevalence of Cognitive impairment

MMSE score	Number (Percentage)
24 - 30	140 (37.2)
< 24	236 (62.8)

Figure 13. Prevalence of cognitive impairment in the study population.

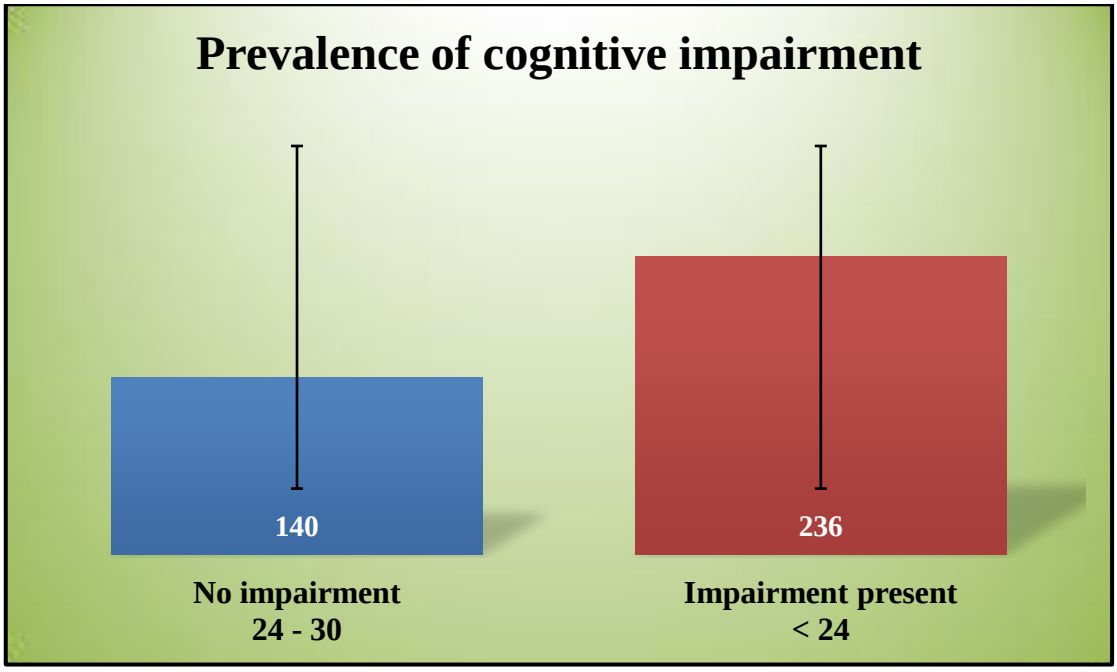
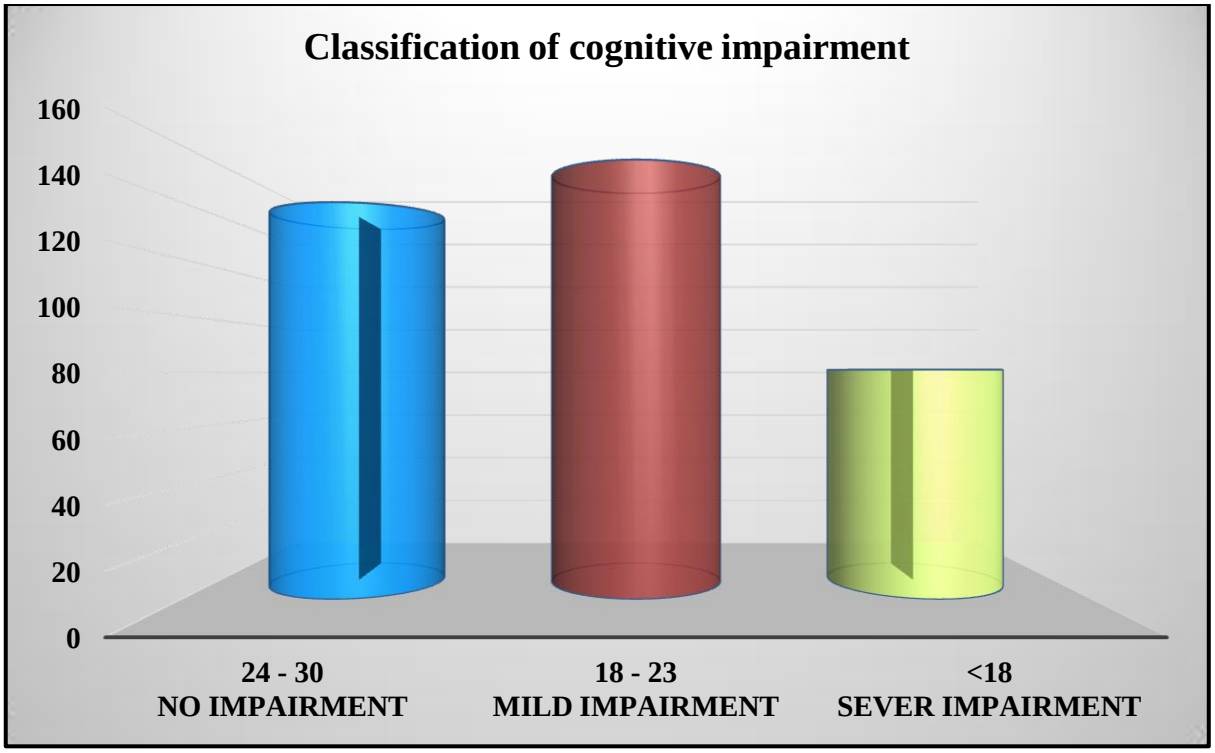


Table 13 explains the classification of cognitive impairment based on severity. From the results, it is evident that 41.3 % of study population are affected with mild cognitive impairment and 21.5% are affected with severe impairment. The figure 14 also explains the same as a bar diagram.

Table 13. Classification of Cognitive impairment based on MMSE scores.

MMSE score	Severity	Number (%)
24 - 30	No impairment	140 (37.2)
18 - 23	Mild impairment	155(41.3)
<18	Severe impairment	81 (21.5)

Figure 14. Classification of cognitive impairment based on MMSE scores.



On analysis of gender differences (Table 14 and Figure 15) in cognitive functions as assessed by MMSE and audio-visual reaction time, it was observed that male participants had significantly higher MMSE scores and lower audio-visual reaction time indicating that female participants have more cognitive impairment compared to males.

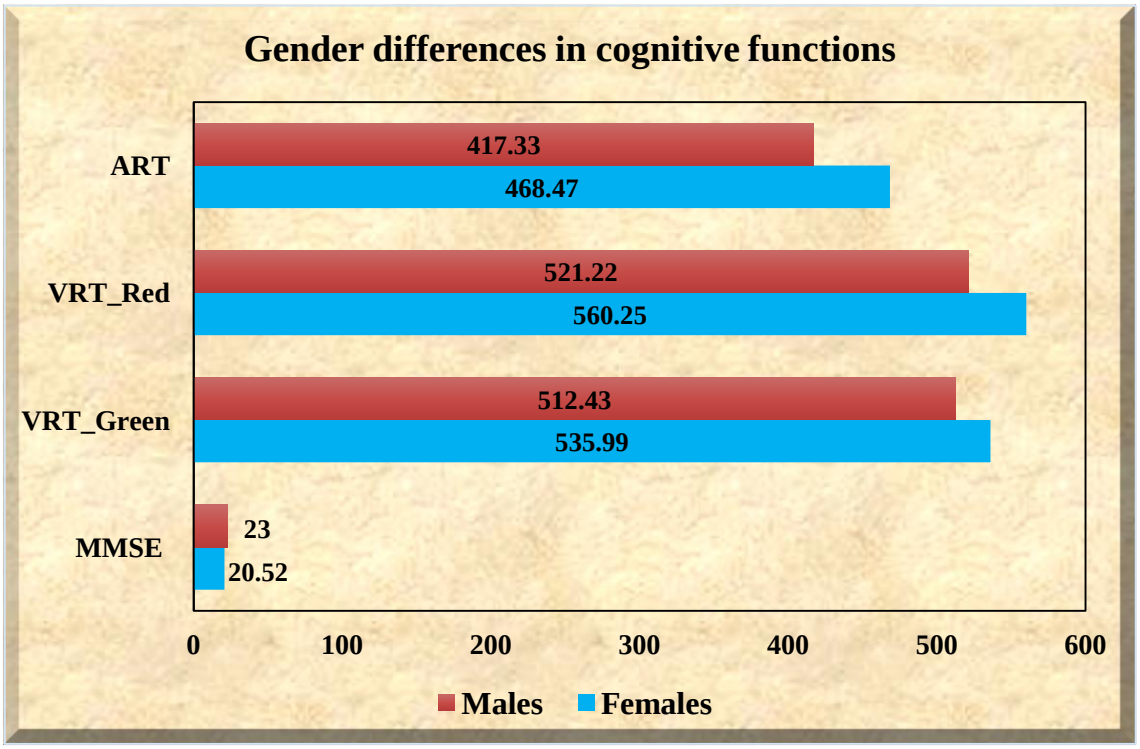
MMSE scores were analysed by Mann Whitney U test and reaction time were analysed by Student's unpaired t test.

Table 14. Gender differences in cognitive functions

Parameter	Females (n=165)	Males (n=211)	Significance
MMSE	20.52 ± 5.87	23.00 ± 4.20	0.0001
VRT_Green	535.99 ± 183.95	512.43 ± 210.01	0.26
VRT_Red	560.25 ± 185.59	521.22 ± 199.89	0.05
ART	468.47 ± 187.67	417.33 ± 160.20	0.005

MMSE scores, represented as median were analysed by Mann Whitney U test. Visual and auditory reaction time, represented as mean ± SD, were analysed by Student's unpaired t test.

Figure 15. Gender differences in cognitive functions



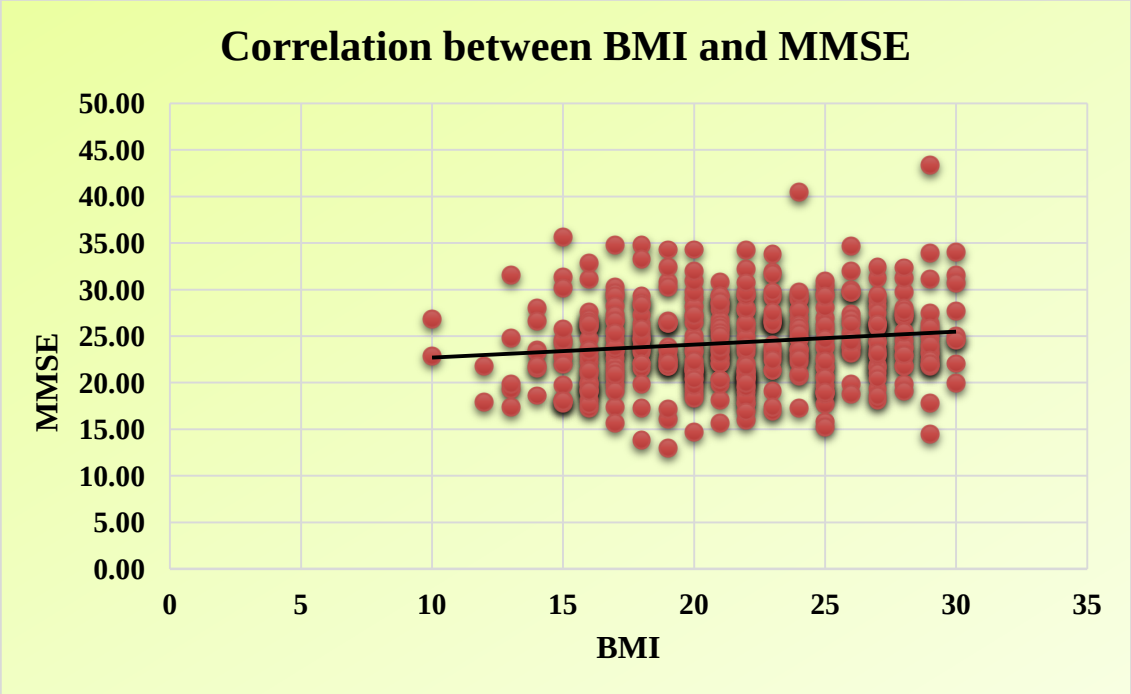
The influence of BMI on MMSE was analysed by Spearman Correlation test which showed strong positive correlation. The visual and auditory reaction time were not found to be significantly correlated with BMI.

This result is explained in table 15 and figure 16.

Table 15. Effect of BMI on cognition

Parameter	Correlation Coefficient	Significance
BMI Vs MMSE	0.143	0.006
BMI Vs VRT-Green	-0.062	0.23
BMI Vs VRT_Red	-0.065	0.21
BMI Vs ART	-0.054	0.29

Figure 16. Correlation between BMI and MMSE.



The study population has been divided into three groups based on duration of diabetes viz. as groups with diabetes less than 5 years, 5 to 10 years and more than 10 years duration. Comparison of MMSE scores among the study participants within these three groups was done by Kruskal-Wallis test, which showed near significant. Table 16 and Figure 17 shows the comparison data. Comparison of audio-visual reaction times are done by One-way ANOVA which was not significant (Figure 18).

Table 16. Comparison of cognitive impairment based on duration of diabetes

Parameter	Less than 5 years (n = 233)	5 – 10 years (n = 70)	More than 5 years (n=73)	Significance
MMSE score	22.57 ± 5.47	22.04 ± 4.69	21.70 ± 4.51	0.05
VRT_Green	520.19 ± 207.51	505.21 ± 153.90	550.54 ± 208.01	0.371
VRT _ Red	530.42 ± 196.34	527.73 ± 166.23	574.69 ± 211.44	0.209
ART	433.14 ± 173.24	432.38 ± 165.74	469.52 ± 185.93	0.276

MMSE scores, represented as median were analysed using Kruskal-Wallis test. Visual and auditory reaction time, represented as mean ± SD, were analysed by One-way ANOVA.

Figure 17. Comparison of MMSE scores with duration of diabetes

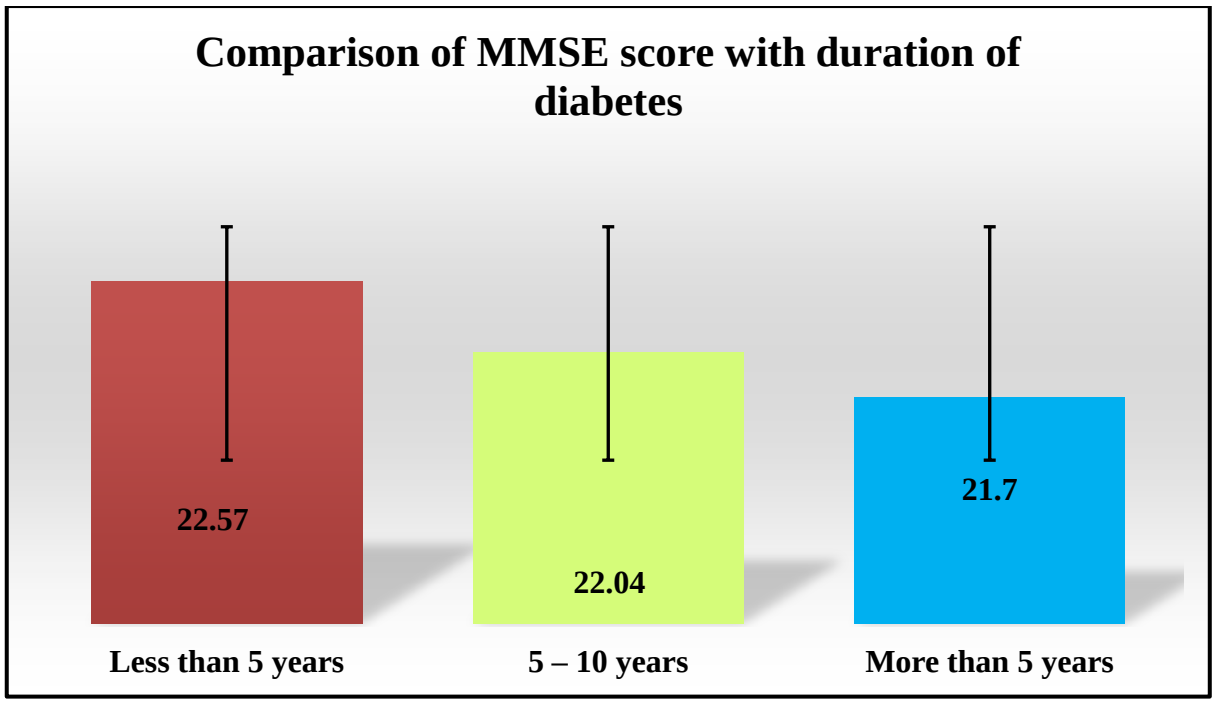
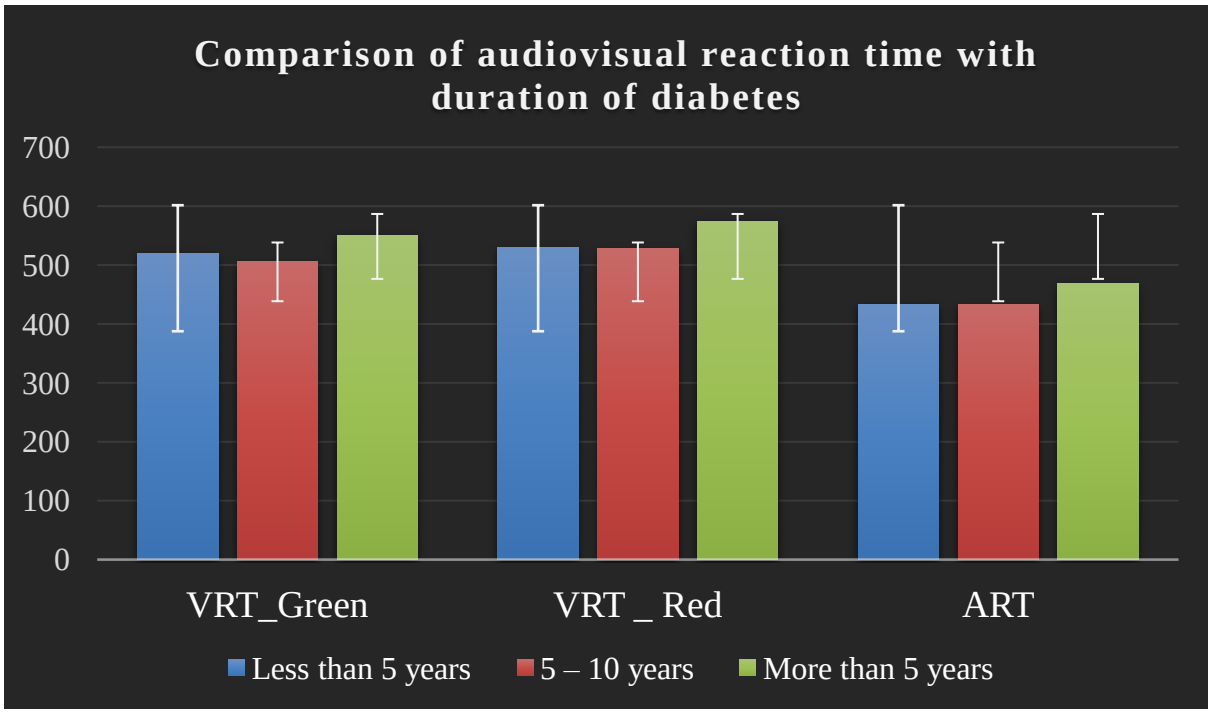


Figure 18. Comparison of audiovisual reaction time with duration of diabetes.

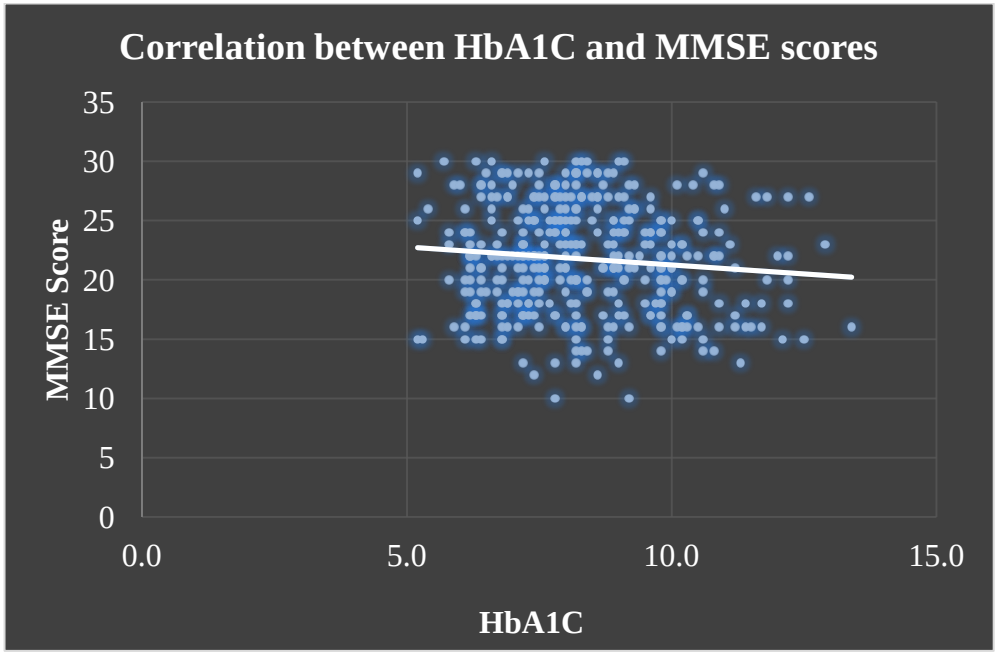


Correlation between the various glycaemic indicators and MMSE using Spearman Correlation test (Table 17, Figure 19, 20, and 21)) has showed that fasting blood sugar has significant negative correlation (r = -.102; p = 0.04) with MMSE scores suggesting that if fasting blood sugar increases, MMSE scores and hence cognitive function decreases. HbA1C and post-prandial blood sugar does not seem to correlate with MMSE significantly.

Table 17. Correlation between Glycaemic indicators and MMSE.

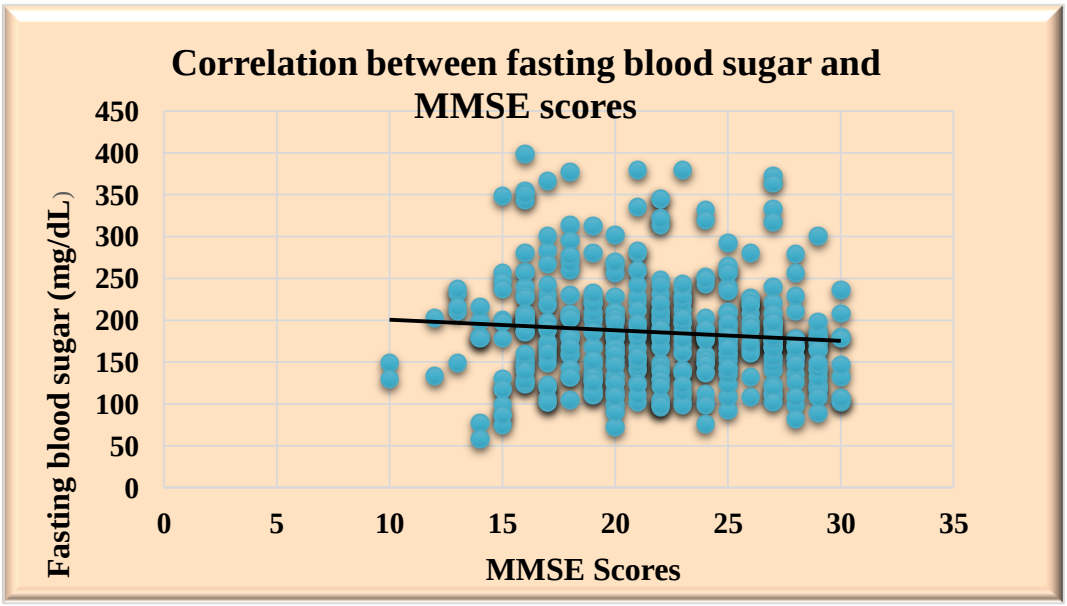
Parameter	Correlation Coefficient	Significance
HbA1C Vs MMSE	- 0.081	0.12
FBS Vs MMSE	-0.102	0.04*
PPBS Vs MMSE	-0.07	0.17

Figure19. Correlation between HbA_1C and MMSE.



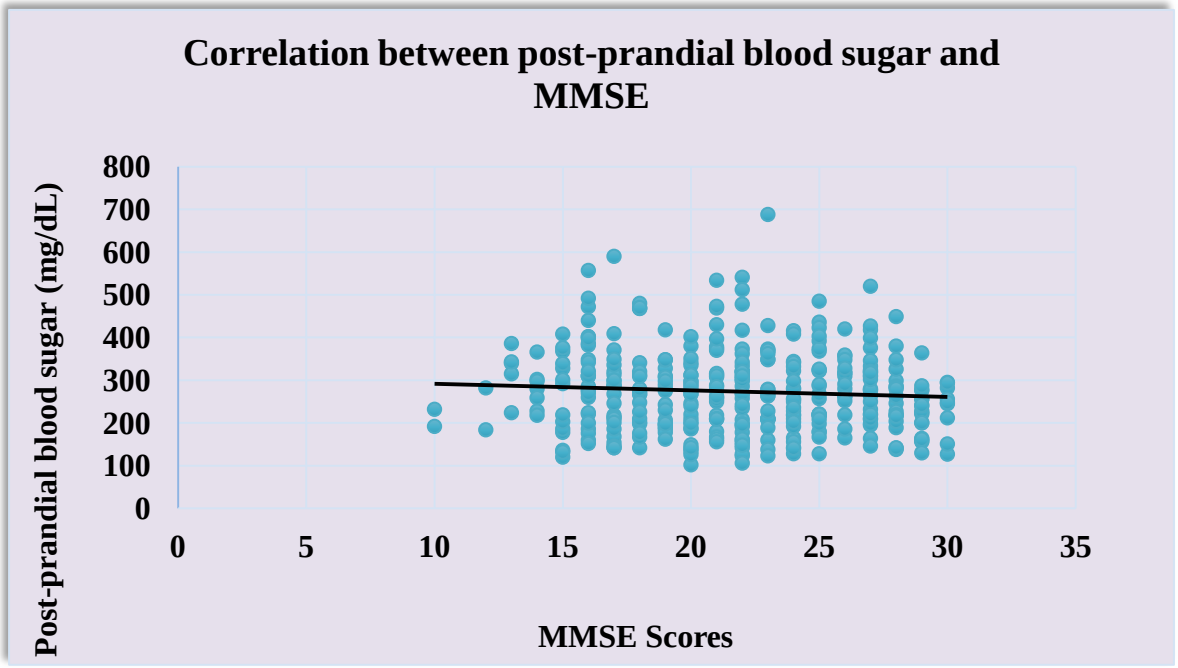
Spearman Correlation test (r = -0.081; p = 0.12; Not significant)

Figure 20. Correlation between fasting blood sugar and MMSE.



Spearman Correlation test (r= -.102, p=0.04); Significant

Figure 21. Correlation between post-prandial blood sugar and MMSE.



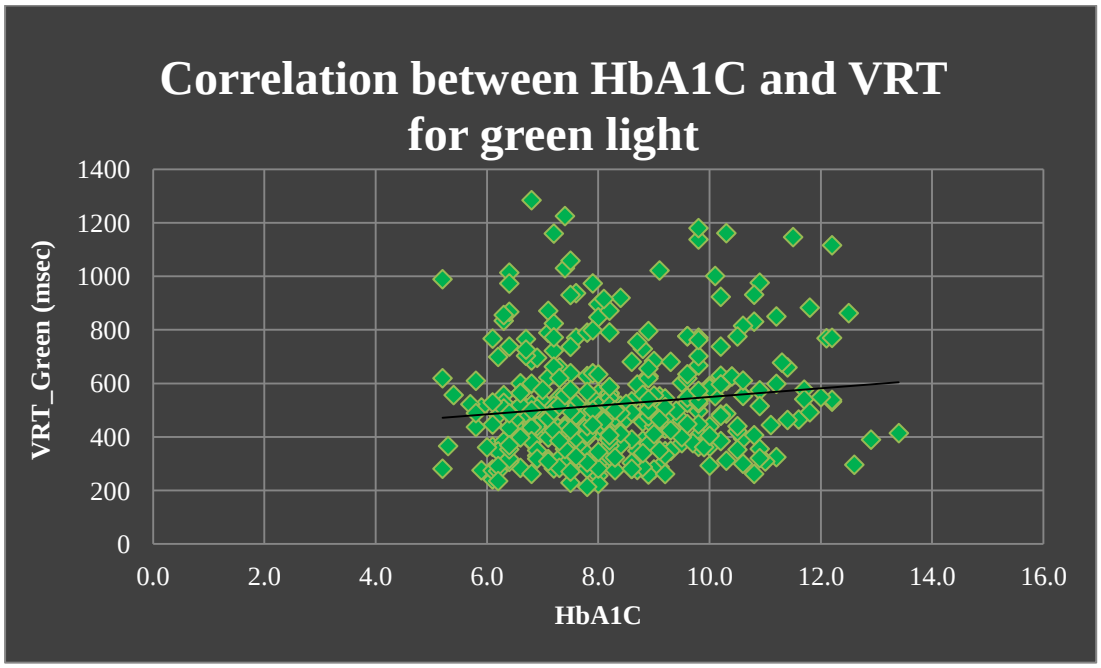
Spearman Correlation test (r= -.07, p=0.17); Significant

Correlation was sought between Reaction time and HbA_1C by Pearson Correlation test which showed strong positive correlation between both Visual and auditory reaction time. Correlation coefficient (r) and p values are given in table 18. Figure 22, 23 and 24 represents the same in a scatter plot.

Table 18. Correlation between HbA_1C and reaction time

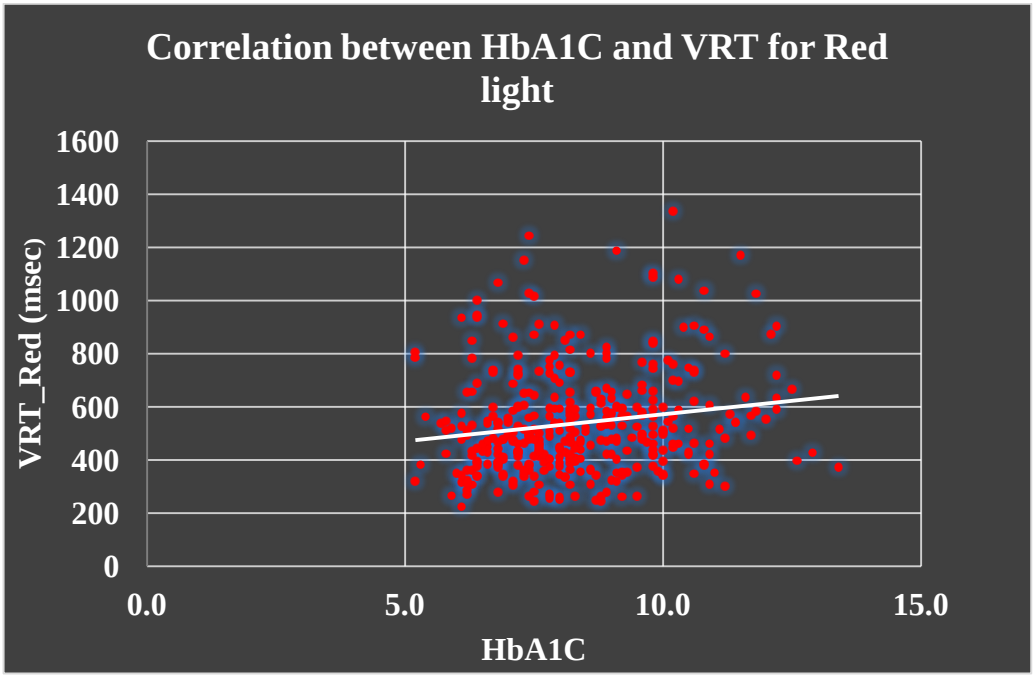
Parameter	Correlation coefficient	Significance
VRT_Green	0.13	0.01*
VRT_Red	0.167	0.001*
ART	0.103	0.04*

Figure 22. Correlation between HbA1C and VRT for green light



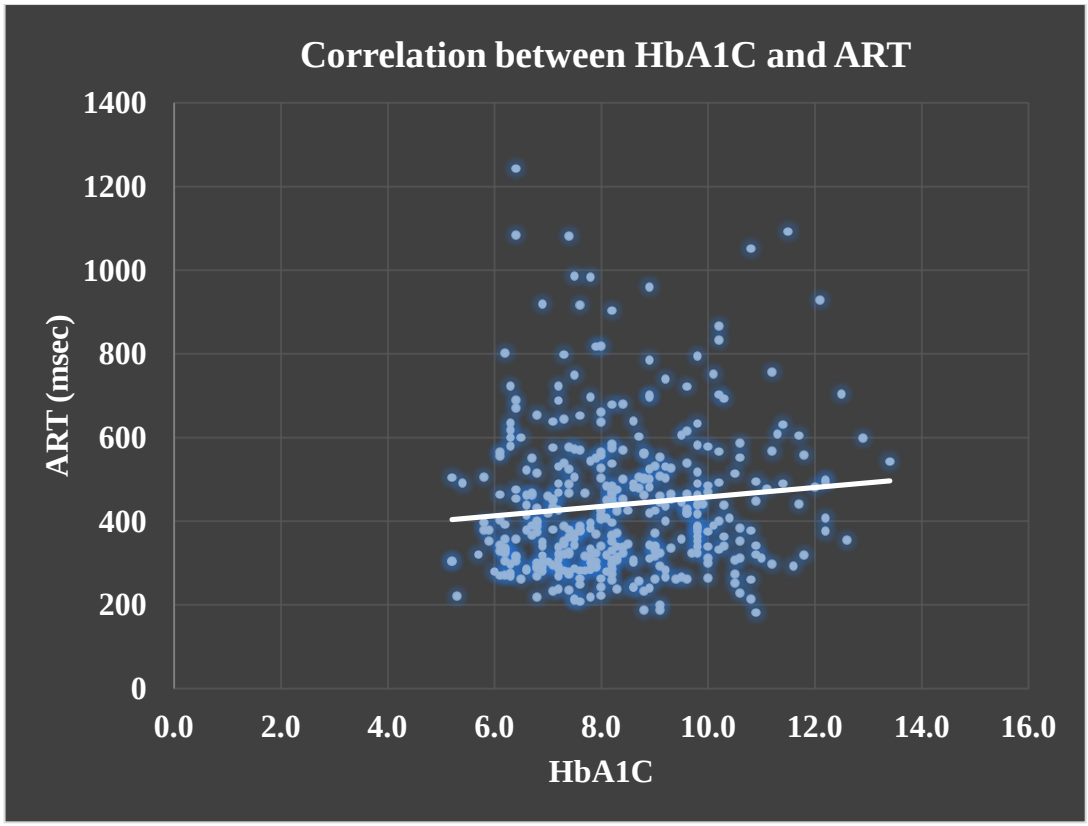
Pearson Correlation test (r=0.13, p=0.01); Significant.

Figure 23. Correlation between HbA1C and VRT for Red light



Pearson Correlation test (r=0.167, p=0.001); Highly Significant

Figure 24. Correlation between HbA1C and Auditory reaction time (ART)



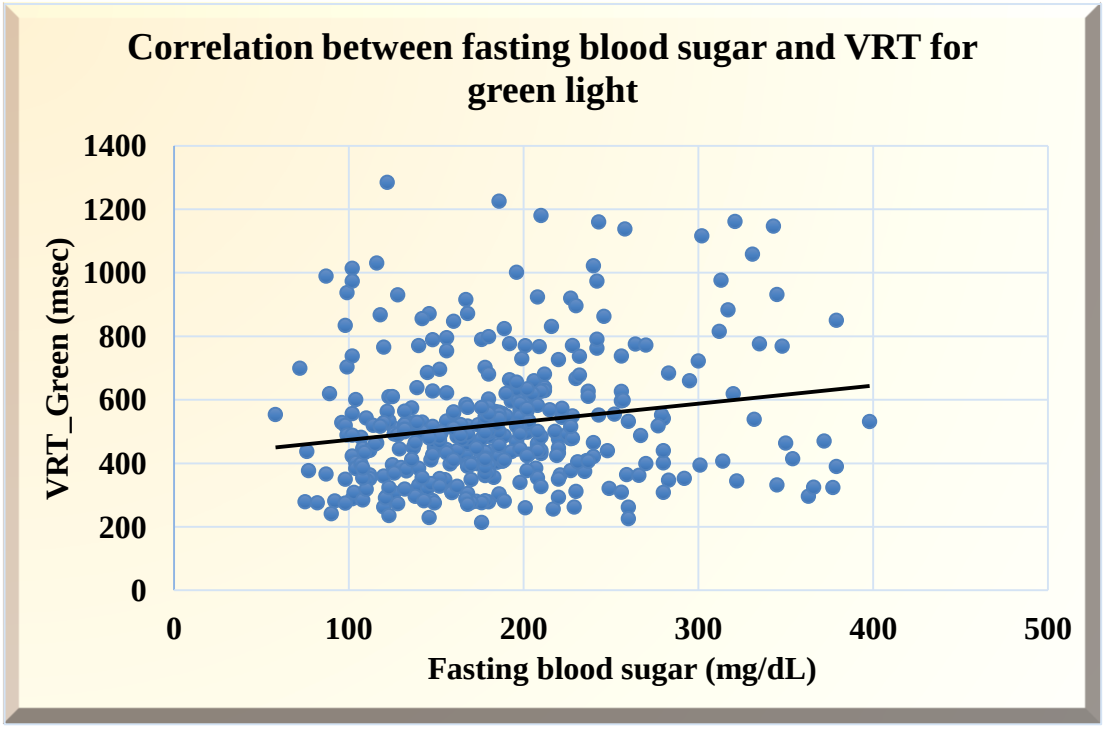
Pearson Correlation test (r=0.103, p=0.04); Significant

Correlation between fasting blood sugar and audio-visual reaction time is assessed by Pearson Correlation test. It was observed that the audio-visual reaction time showed strong positive correlation with fasting blood sugar levels. The correlation coefficient and significance levels are depicted in the table 19 and Figures 25, 26 and 27.

Table 19. Correlation between Fasting blood sugar and reaction time

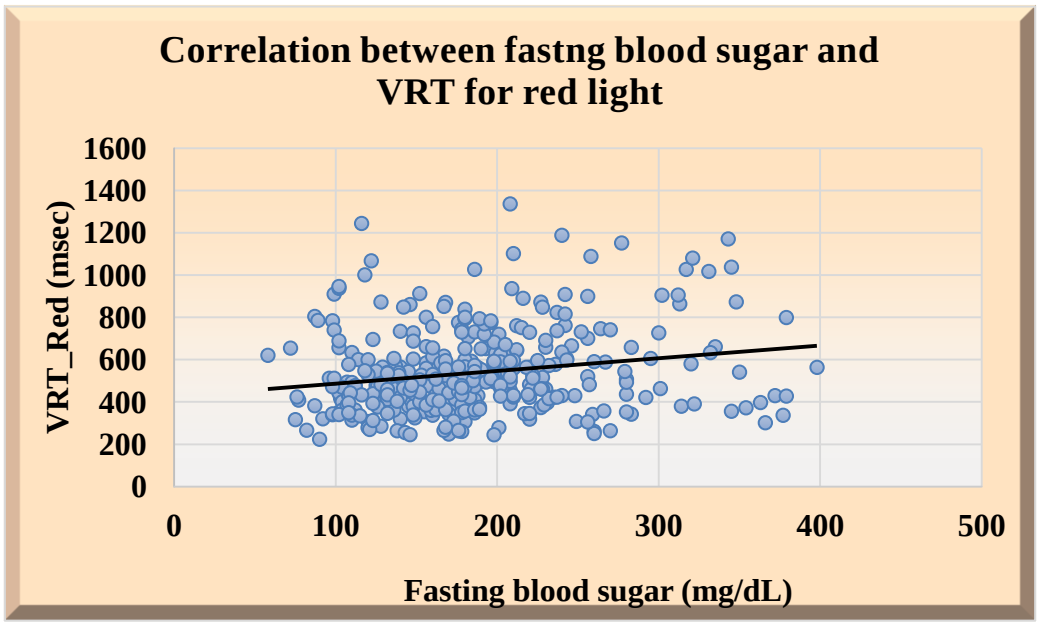
Parameter	Correlation coefficient	Significance
VRT_Green	0.182	0.0001*
VRT_Red	0.197	0.0001*
ART	0.132	0.01*

Figure 25. Correlation between fasting blood sugar and VRT for green light



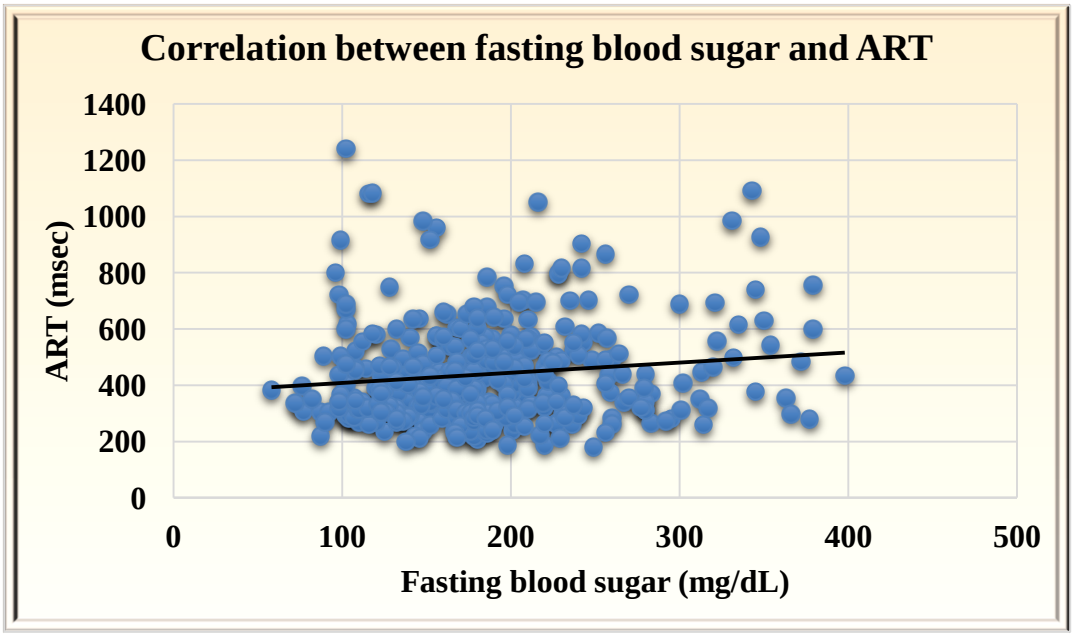
Pearson Correlation test (r=0.182, p=0.0001); highly significant.

Figure 26. Correlation between fasting blood sugar and VRT for red light



Pearson Correlation test (r=0.197, p=0.0001); highly significant.

Figure 27. Correlation between fasting blood sugar and ART



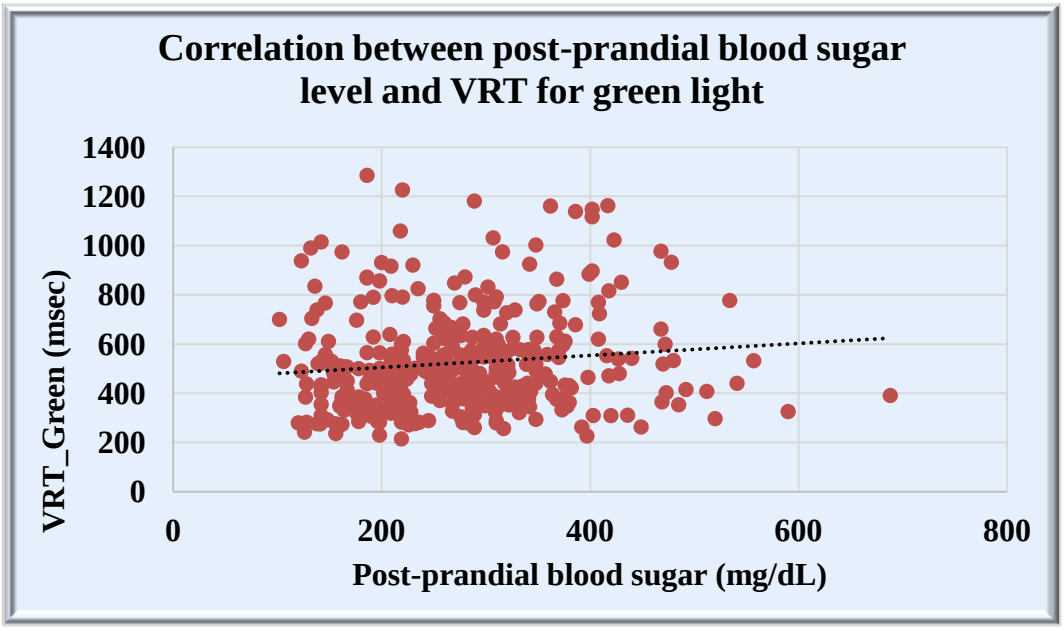
Pearson Correlation test (r=0.132, p=0.01); significant

Analysis of correlation between post-prandial blood sugar and audio-visual reaction time, done by Pearson Correlation test showed positive correlation with visual reaction time but not with auditory reaction time. The details are depicted in table 20, figures 28, 29 and 30.

Table 20. Correlation between postprandial blood sugar and reaction time

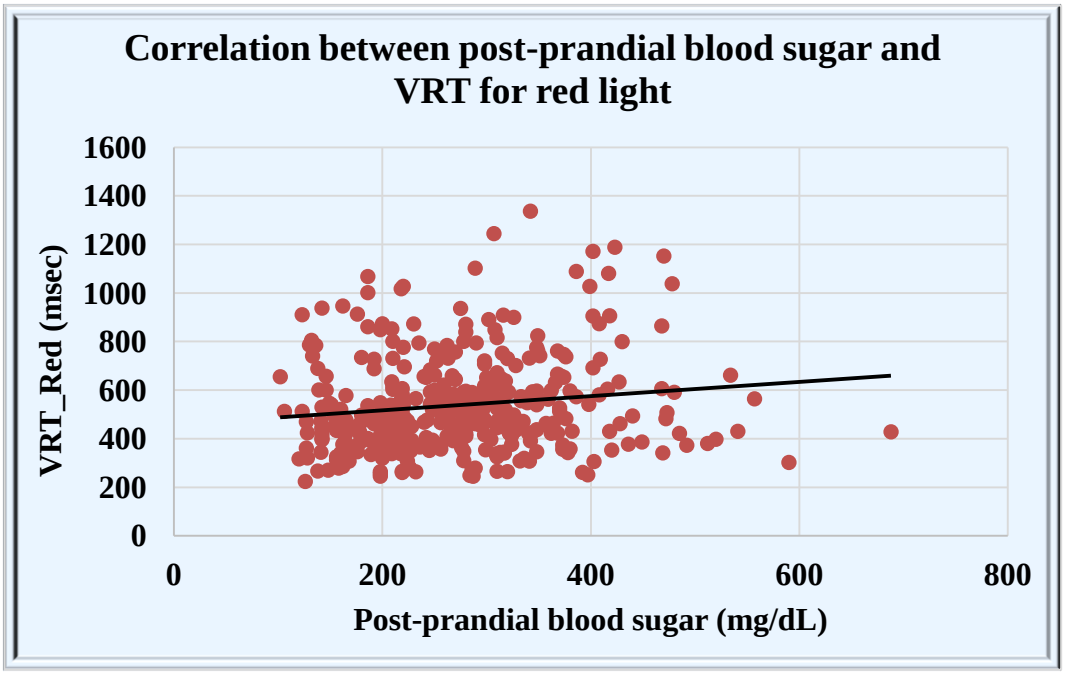
Parameter	Correlation coefficient	Significance
VRT_Green	0.115	0.02*
VRT_Red	0.141	0.006*
ART	0.068	0.19

Figure 28. Correlation between post-prandial blood sugar and VRT for green light



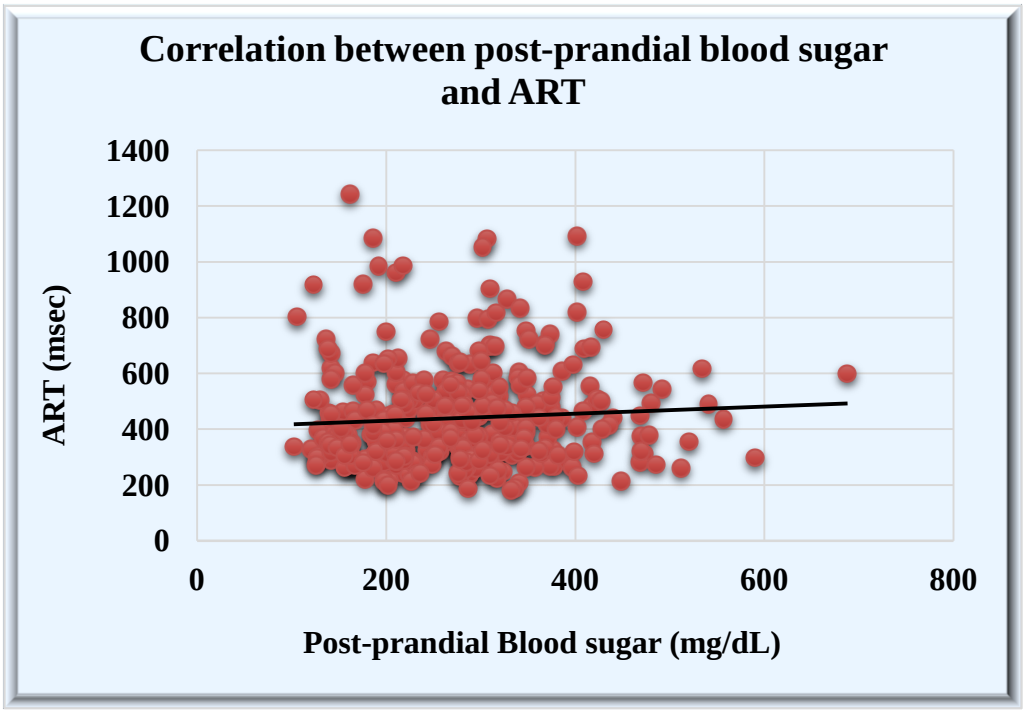
Pearson Correlation test (r=0.115, p=0.02); Significant.

Figure 29. Correlation between post-prandial blood sugar and VRT for red light



Pearson Correlation test (r=0.141, p=0.006); highly Significant.

Figure 30. Correlation between post-prandial blood sugar and VRT for red light



Pearson Correlation test (r=0.068, p=0.19); not significant.

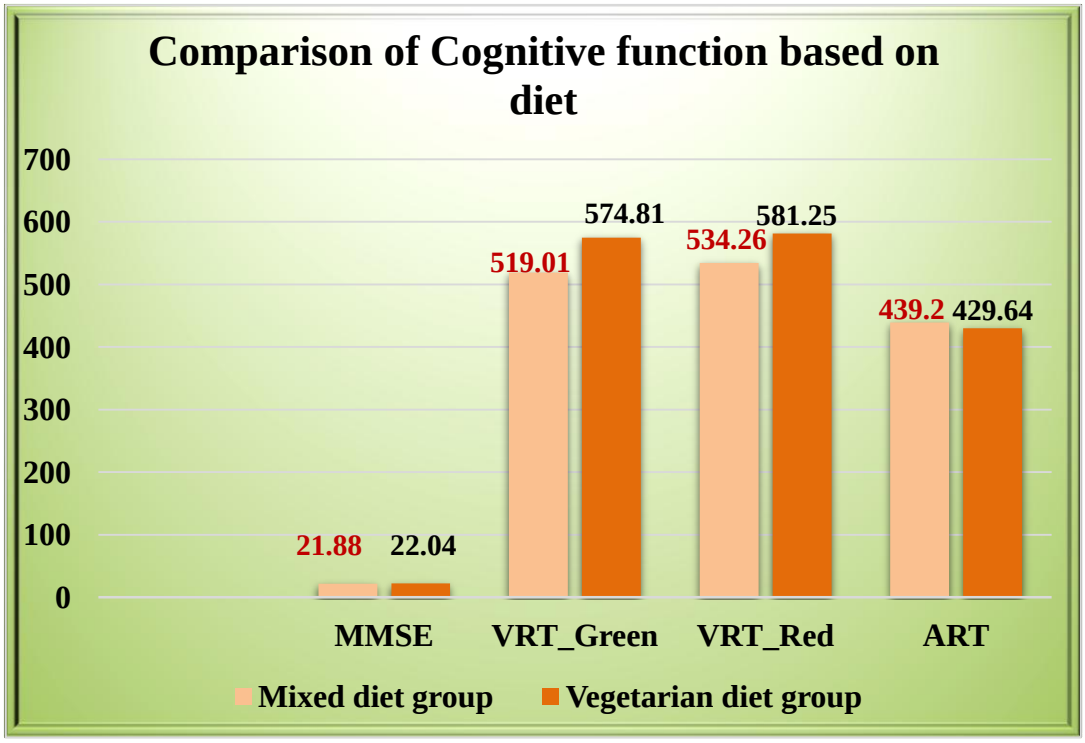
Based on diet, the study participants are divided into two groups, viz, Mixed diet group (n=352) and vegetarian diet group (n=23). MMSE scores are compared using Mann-Whitney U test which showed lack of significance between the two groups. Audio-visual reaction time was compared using Students' unpaired t test which also showed no significant difference. Tables 21 and figure 31 represent the same.

Table 21. Comparison of cognitive impairment based on diet

Parameter	Mixed diet group (n=352)	Vegetarian diet group (n=23)	Significance
MMSE	21.88 ± 5.12	22.04 ± 5.12	0.79
VRT_Green	519.01 ± 198.35	574.81 ± 208.36	0.19
VRT_Red	534.26 ± 195.06	581.25 ± 184.99	0.27
ART	439.20 ± 175.07	429.64 ± 152.87	0.79

MMSE values were represented as median. Comparison done by Mann-Whitney U test. Audio-visual reaction time, represented as mean ± SD; compared by Student's unpaired T test.

Figure 31. Comparison of cognitive impairment based on diet



Based on involvement in physical activity, the study participants are divided into two groups, viz, 'physically active' group (n=91) and 'physically inactive' group (n=285). MMSE scores are compared using Mann-Whitney U test which showed lack of significance between the two groups. Audio-visual reaction time was compared using Students' unpaired t test which also showed no significant difference. Tables 22 and figure 32 represent the same.

Table 22. Comparison of cognitive impairment based on physical activity

Parameter	'With physical activity' group (n=91)	'Without physical activity' group (n=285)	Significance
MMSE	21.36 ± 4.34	22.06 ± 5.39	0.298
VRT_Green	539.72 ± 192.73	516.98 ± 200.82	0.34
VRT_Red	556.91 ± 190.35	532.08 ± 195.45	0.28
ART	455.94 ± 179.67	434.30 ± 172.56	0.30

MMSE values were represented as median. Comparison have been done by Mann-Whitney U test. Audio-visual reaction time represented as mean ± SD; compared by Student's unpaired T test.

Figure 32. Comparison of cognitive impairment based on physical activity.

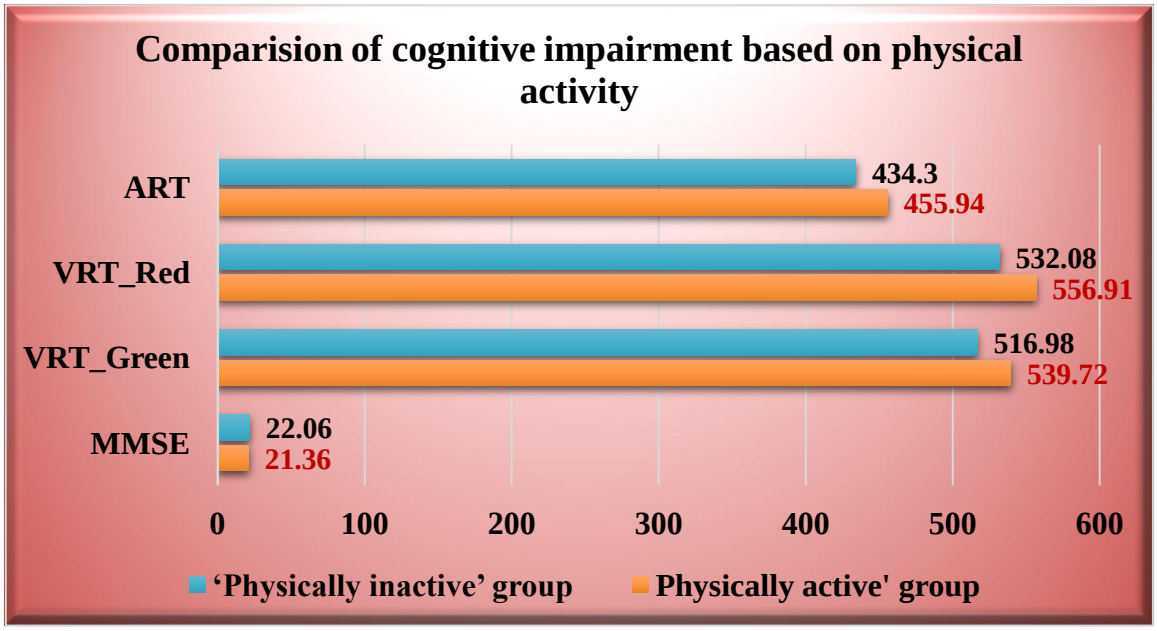


Table 23 shows the comparison of cognitive impairment based on the habit of smoking. The study population were divided into two groups, as smokers (n=75) and non-smokers (n=301). MMSE scores compared using Mann-Whitney U test which showed significant cognitive impairment in non-smokers group. Audiovisual reaction time, compared using Student's unpaired T test showed no significant difference. Figure 33 represents the same as a bar diagram.

Table 23. Comparison of cognitive impairment based on the habit of smoking

Parameter	Smokers (n=75)	Non-smokers (n=301)	Significance
MMSE	21.44 ± 5.38	23.68 ± 3.70	0.001
VRT_Green	523.24 ± 191.46	519.46 ± 227.63	0.34
VRT_Red	542.88 ± 190.18	518.87 ± 210.15	0.28
ART	445.06 ± 173.51	417.36 ± 176.92	0.30

MMSE values, represented as median. Comparison was done by Mann-Whitney U test. Audio-visual reaction time, represented as mean ± SD; compared by Student's unpaired T test.

Figure 33. Comparison of MMSE scores based on the habit of smoking.

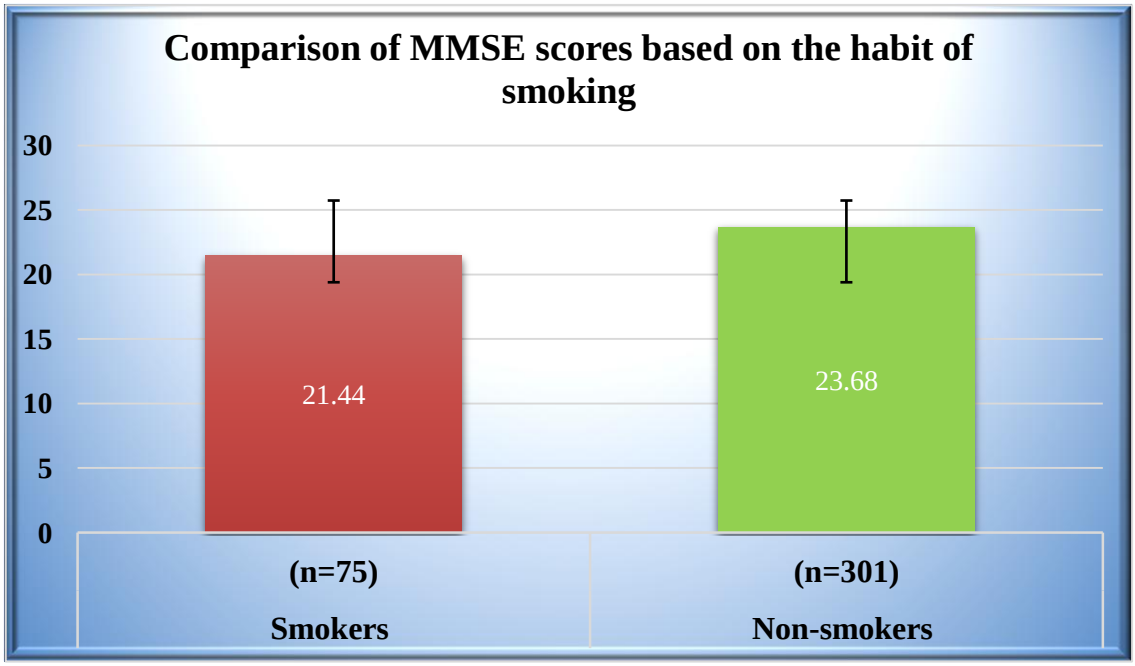


Table 24 shows the comparison of cognitive impairment based on the habit of alcoholism. The study population were divided into two groups, as alcoholics (n=143) and non-smokers (n=233). MMSE scores compared using Mann-Whitney U test showed highly significant cognitive impairment in non-alcoholic group. Audiovisual reaction time, compared using Student's unpaired T test also showed significant cognitive impairment in non-alcoholic group. Figure 34 and Figure 35 represents the same as bar diagrams.

Table 24. Comparison of cognitive impairment based on the habit of alcoholism

Parameter	Alcoholics (n=143)	Non-alcoholics (n=233)	Significance
MMSE	21.16 ± 5.65	23.08 ± 4.00	0.0001
VRT_Green	539.18 ± 199.46	495.28 ± 195.58	0.03
VRT_Red	555.29 ± 189.85	510.06 ± 198.74	0.02
ART	455.29 ± 187.00	413.28 ± 148.44	0.02

Figure 34. Comparison of MMSE based on the habit of alcoholism

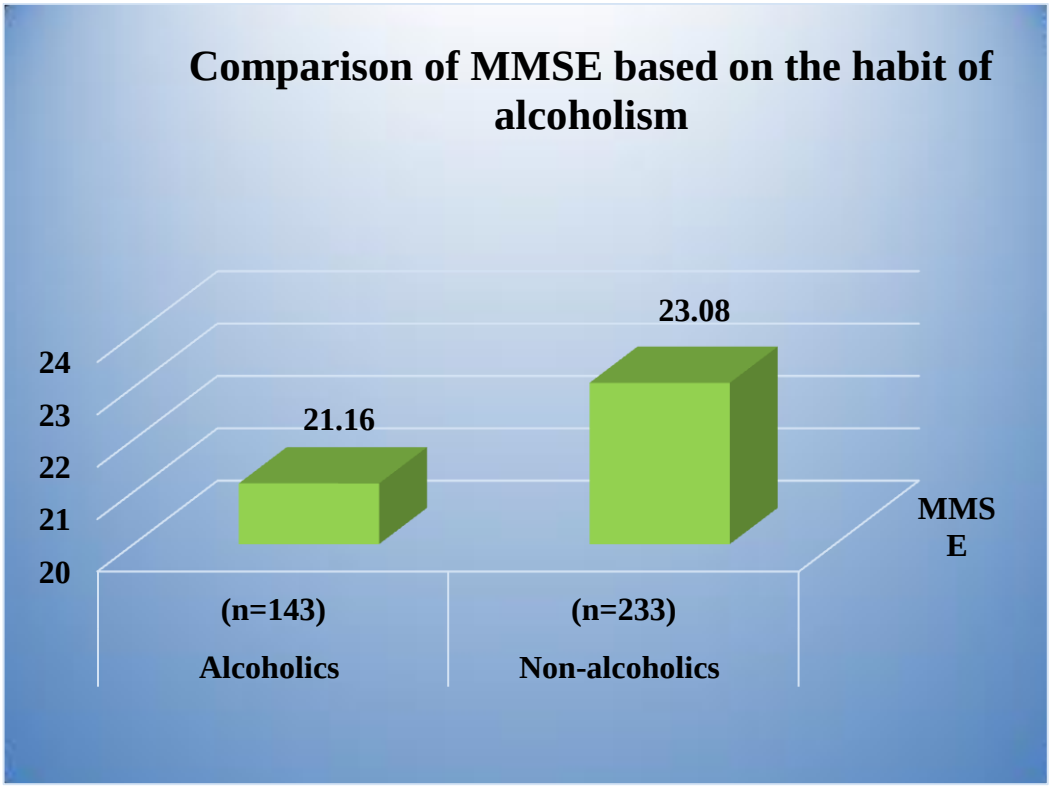


Figure 35. Comparison of audio-visual reaction time based on the habit of alcoholism

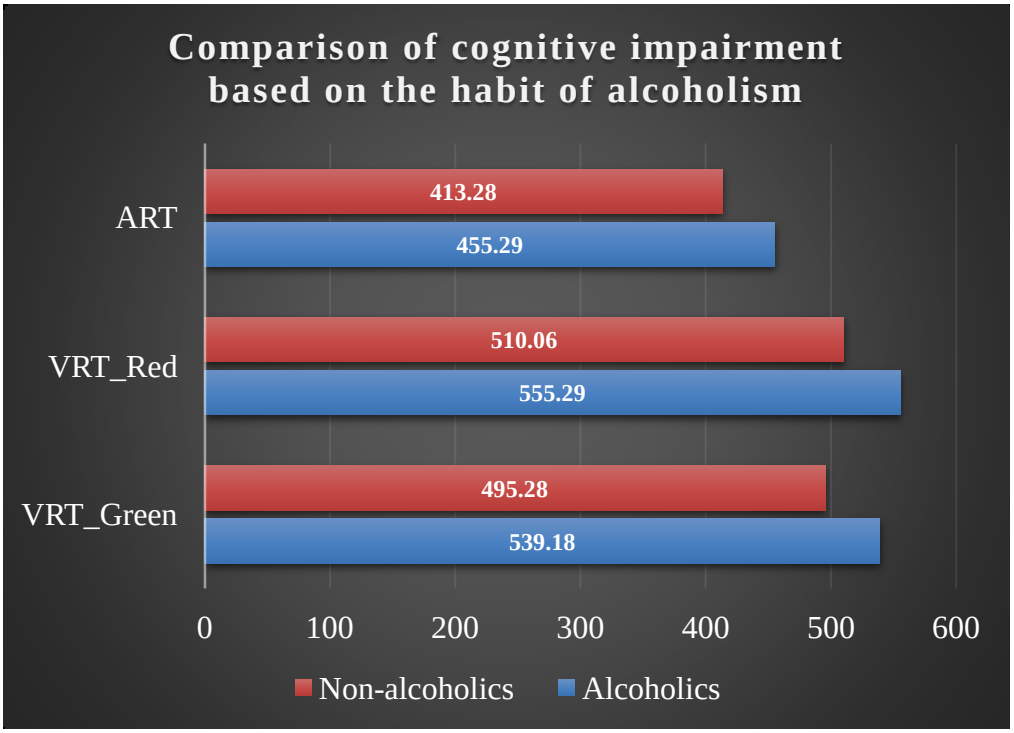


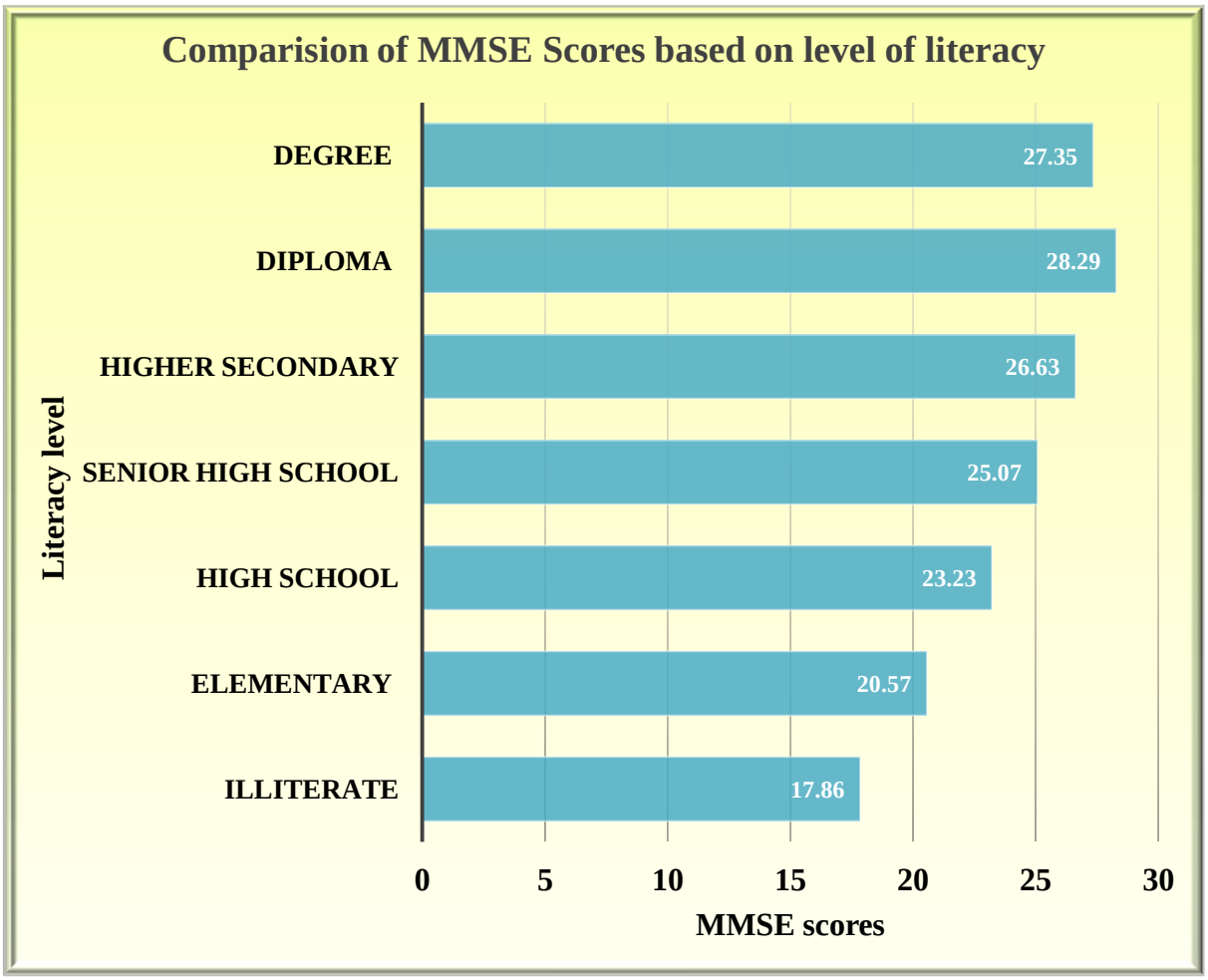
Table 25 shows the comparison of cognitive impairment with respect to the level of literacy among the study participants. The study population were divided into seven groups, as Illiterate, Elementary, High school, Senior high school, higher secondary, Diploma and Degree. MMSE scores compared using Kruskal Wallis test, which showed highly significant cognitive impairment within the groups. As the literacy level increased, the MMSE scores also increased indicating that status of education influences cognitive function. Audio-visual reaction time, compared using one-way ANOVA also showed significant cognitive impairment in the groups with least education. Figure 36, 37and 38 represents the same as bar diagrams.

Table 25. Influence of literacy on cognitive functions

Level of literacy	MMSE	VRT_Green	VRT_Red	ART
Illiterate	17.86 ± 5.86	543.97 ± 191.6	566.53 ± 201.78	473.28 ± 202.22
Elementary	20.57 ± 3.41	548.28 ± 218.26	561.32 ± 211.28	466.89 ± 188.28
High School	23.23 ± 3.33	534.17 ± 215.65	548.17 ± 197.45	432.13 ± 166.82
Senior high school	25.07 ± 3.02	484.59 ± 164.11	496.89 ± 150.36	404.62 ± 132.08
Higher secondary	26.63 ± 2.5	477.70 ± 208.36	462.49 ± 118.11	359.82 ± 101.76
Diploma	28.29 ± 1.38	401.3 ± 98.36	420.83 ± 118.5	367.89 ± 118.58
Degree	27.35 ± 2.28	455.31 ± 171.19	487.47 ± 218.51	368.93 ± 85.28
F value	38.779	1.885	2.225	2.882
P value	0.0001	0.08	0.04	0.009

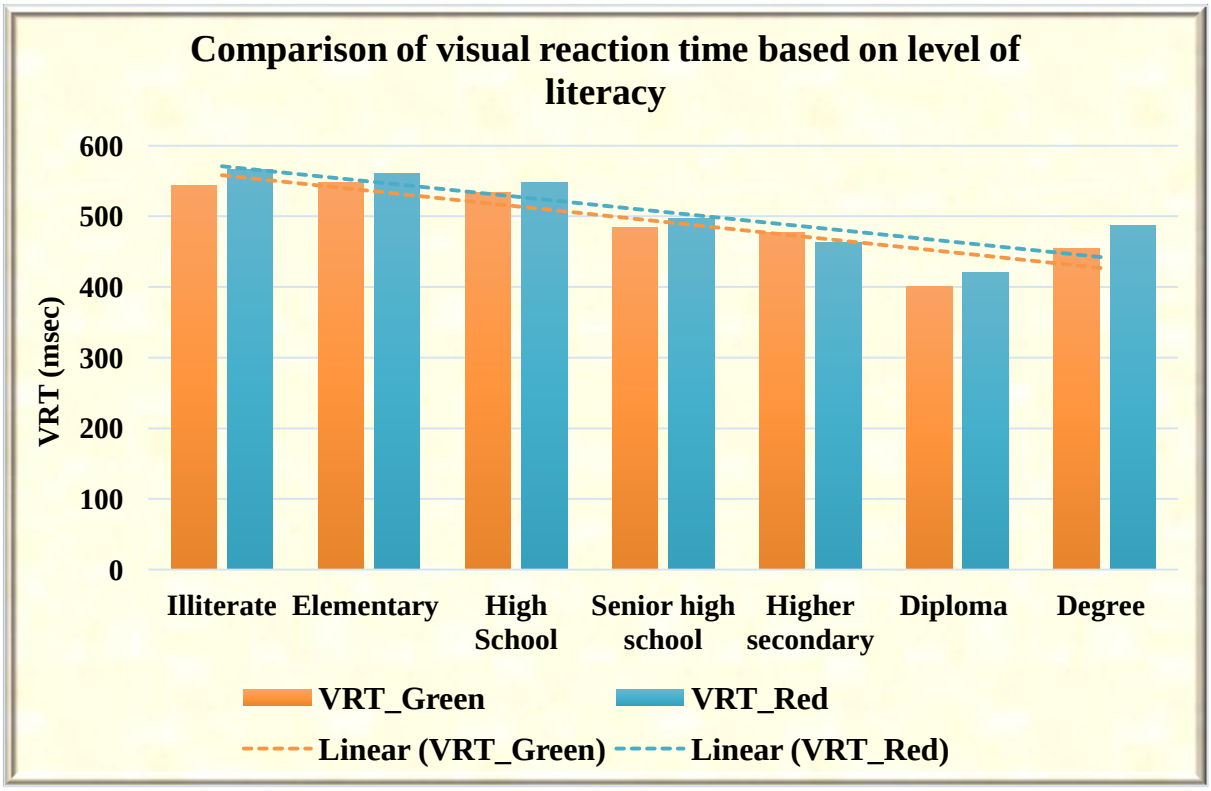
MMSE scores are analysed by Kruskal-Wallis Test, whereas Visual and auditory reaction time are analysed by one-way ANOVA.

Figure 36. Comparison of MMSE scores based on level of literacy



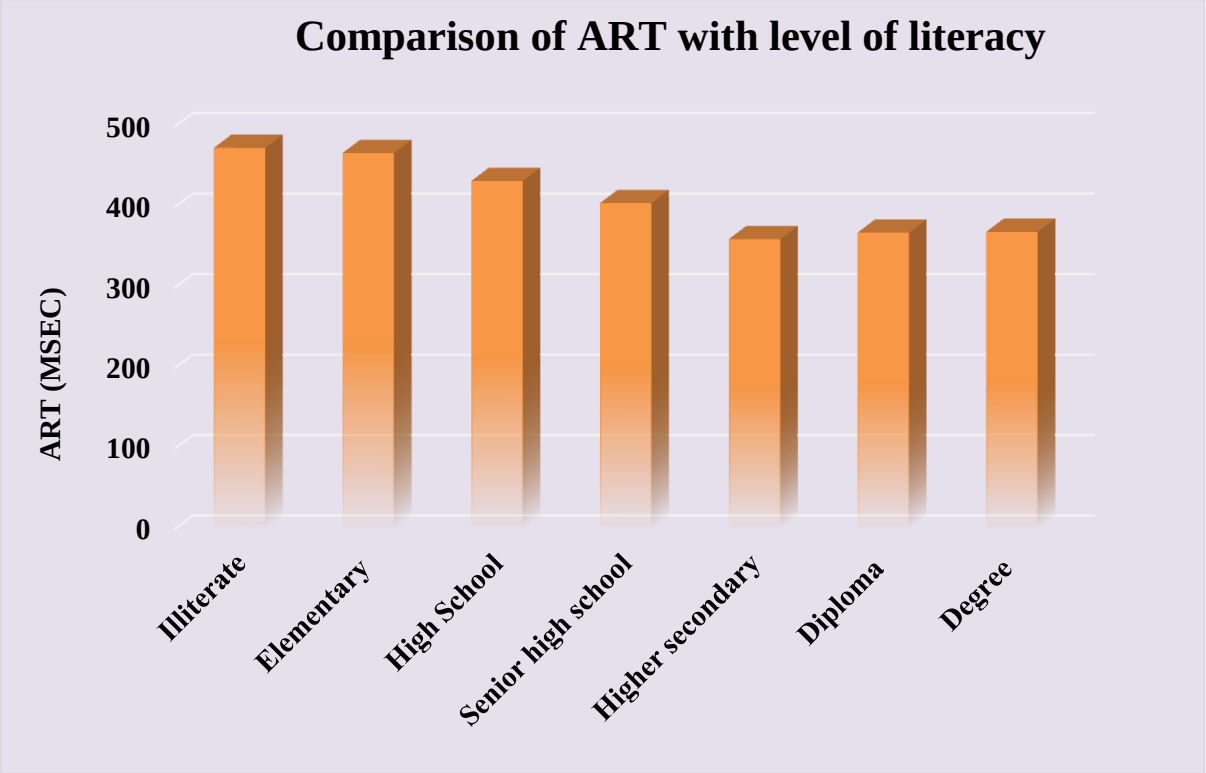
MMSE scores are represented as median and are analysed by Kruskal Wallis test.

Figure 37. Comparison of visual reaction time based on level of literacy



Visual reaction time, represented as mean ± SD; compared by One-way ANOVA test.

Figure 38. Comparison of auditory reaction time based on level of literacy



Auditory reaction time, represented as mean ± SD; compared by One-way ANOVA

Discussion

DISCUSSION

This cross-sectional study was done on 376 patients with type 2 diabetes mellitus of both gender to assess the cognitive impairment and the factors influencing cognition. **Mohan et al[62]** in their study **CURES – 9,** has stated that though according to the WHO[45], the mean age group of diabetic people is >65 years in developed countries, in India and other developing countries, the highest increase would occur in the age group of 45 – 64 years which includes people in the peak of their lives. Another study by Kumpatla et al[63] have reported the onset of diabetes at a much younger age in the Indian population compared to previous years (45 ± 10.6[2009] vs. 49.9[1999] ± 9.8 years, P < 0.0001). This study is in concurrence with the same with the mean age of the study population is 51.47 ± 8.04 years.

Prevalence of cognitive dysfunction in diabetes.

The primary objective of this study is to estimate the prevalence of cognitive impairment in patients with type 2 diabetes mellitus based on MMSE values. MMSE scores < 24 is set as the cut-off point, below which indicate cognitive impairment.[45] Accordingly, the prevalence in this study was calculated as 62.8% which was very high compared to the previous studies. When classifying cognitive impairment based on severity, it was observed that 41.3% had mild cognitive impairment (MMSE scores of 18 – 23) and 21.5% had severe impairment (MMSE scores of <18). Mukerje et al[27] in their study, have shown that the prevalence of cognitive impairment in diabetic population is as high as 42%. Gao et al[25] in their

large cross-sectional study have shown that the prevalence of mild cognitive impairment (MCI) and dementia in patients with type 2 diabetes mellitus was found to be 13.5 % and 2.34 % respectively Subha K[62] in their study have found that the prevalence of cognitive impairment based on MMSE was 63.33% which is in line with the current study.

Assessment of cognition using MMSE and RT

MMSE

In a large population-based study by A. Marseglia et al[65], the median MMSE scores were observed to be 28 ± 2. In another study by Goh et al[64], they have recorded a mean MMSE score of 27.7± 1.5. Subha et al[62] in their study have documented that the mean MMSE scores in diabetic people were 24.48 ± 3.97.(3) Alenkar et al[65] in a study including 346 diabetic patients have observed that the median score of MMSE was 26 with the range of 16 to 30. The median scores of MMSE in this study was found to be very less 22 with the range of 10 – 30. This suggests that there is an overall decline in cognitive function in the category of mild cognitive dysfunction

Visual and auditory reaction time

The mean visual reaction time found in our study participants was 522.49 ± 198.88 and 538.09 ± 194.27 milliseconds for green and red light, respectively. Mean auditory reaction time was found to be 439.38 ± 174.31 milliseconds. Average Reaction Time for human is 250 milliseconds to visual stimuli and 170 milliseconds to an auditory stimulus.[66] Both the auditory and visual reaction time is

increased in this study population suggesting the possibility of cognitive dysfunction.

Our study shows that the ART is faster than the VRT. Similar results have been observed in the previous studies. Pain and Hibbs et al[67] shows that simple ART has the fastest RT for any given stimulus. Research by Kemp et al [68] show that an auditory stimulus takes only 8–10 ms to reach the brain, but a visual stimulus takes 20-40 ms. Hence the auditory stimulus reaches the cortex faster than the visual stimulus, the ART is faster than the VRT. Shelton and Kumar et al[69] also concluded that simple RT is faster for auditory stimuli compared with visual stimuli and auditory stimuli has the fastest conduction time to the motor cortex along with fast processing time in the auditory cortex. Our study further supports the evidence that ART is faster than the VRT.

Gender differences in cognition

The male: female distribution in our study was 211(56.1%) and 165 (43.9%). In a study by Alenkar et al[65], it was stated that men presented higher MMSE score than women (26.3 ± 3.2 Vs 24.8 ± 2.7; $p < 0.01$). Similar results have been furnished by Gregg et al that They have also confirmed that the association was independent of age, HbA1C, hypertension, dyslipidemia and duration of diabetes. Cynthia A. Munro et al[70], in their study has concluded that men and women were indistinguishable on tests of auditory divided attention, category fluency, and executive functioning but women performed better than men on tests of

psychomotor speed and verbal learning and memory, whereas men outperformed women on tests of visuoconstruction and visual perception. Thilers et al[71] , have explained that the male hormone testosterone has been related to performance on visuospatial tasks, and appears to have an increasing influence on these tasks with advancing age in men but not women (10). On the other hand, Ryan Joanne et al[72], have stated that the lifetime exposure to oestrogen may be associated with better performance in some cognitive domains but worse performance in other cognitive domains. Similarly Dhangauri shenvi et al[54] in their research have proved that both auditory and visual reaction time were longer in men compared to women (12)

In this study, it was observed that the men have higher MMSE scores, visual reaction time for red light and auditory reaction time than women, all of which are in line with the previous studies. This may also be due to the fact that men had longer years of education than women.

Cognition and duration of diabetes

The mean duration of diabetes since diagnosis in the study population is 6.17 ± 6 years. It was found that the as the duration of diabetes increased, the MMSE scores decreased and the visual and auditory reaction time were increased though it was not statistically significant. This shows that the duration of diabetes has no bearing over cognition. Similar results have been observed in Bruce et al[73] who stated that for each 5 years increase in the duration, risk of cognitive impairment increased by the odds ratio of 1.69. Marseglia et al[63] has also observed a similar finding that the

duration of diabetes has no association with cognitive function. In another study by Gregg et al[74], they have stated that the odds of cognitive impairment increases with increase in the duration of diabetes as assessed by Digit Symbol and Trails B tests. Rebecca et al[75] have proved that duration of T2D was associated with executive functions. The longer the duration, the greater will be the impact of hyperglycemia and other risk factors of cognitive dysfunction. Rebecca et al[75] explains that the relationships of duration of T2D with cognitive domains other than episodic memory, i.e. executive functions, semantic categorization, and attention, working memory, became stronger with poorer glycemic control which in turn suggest that duration of disease alone may not affect cognition if HbA1c is well controlled over many years.

Cognition and Body Mass Index

The mean BMI of the study population was 24.328 ± 4.54. In this study, it was observed that as the BMI increased, the cognitive impairment was found to be less as suggested by better MMSE scores. This shows that overweight and obesity has a protective role against cognitive impairment.

Similar results have been observed by few studies where they have proved that individuals with high BMI (BMI>25 kg/m^2) have been observed to have a lower risk of cognitive impairment.[76,77] A large study on Korean population has stated that increased BMI at later years of age has shown less association with cognitive impairment.[78] On the contrary studies have also shown that impaired glucose tolerance and central obesity, have found reduced performance on mental status

exams as well as reduced performance on processing speed, attention, executive functioning, and learning and recall.[79] The effect of BMI on cognition is still controversial and is not clear whether it is protective or detrimental.

Cognition and glycemic indicators

The glycemic indicators (mean ± SD) that were used in this study were HbA_1C (8.35 ± 1.6), fasting blood sugar (185.76 ± 63.49) and post-prandial blood sugar (273.63 ± 93.32). It was observed that fasting blood sugar showed negative correlation with MMSE scores indicating that as fasting blood sugar increases cognitive impairment increases. Similarly, HbA_1C, fasting and post-prandial blood sugar showed strong positive correlation with reaction time. This clearly shows that poorer the glycemic status, worse is the cognitive impairment.

One study in postmenopausal women found that the risk of MCI and dementia increased with each 1% elevation in glycosylated hemoglobin, which is a stable measure of glucose.[80] Type 2 diabetes is a state of hyperinsulinemia and insulin resistance. It is also postulated that higher levels of insulin resistance are correlated to poorer attention.[26] Post-prandial glucose levels are reflected by HbA1C rather than fasting glucose values.

HbA1c has been shown to reflect postprandial glucose elevations more than fasting glucose values in T2DM.[81] and it has been proved that oscillations in

glucose are associated with accelerated oxidative stress and deleterious effects in both non-diabetics and individuals with T2DM. The effects of post-prandial hyperglycaemia could contribute to the frontal lobe-based cognitive dysfunction. Although individuals with uncontrolled diabetes had lower cognitive performance than those with controlled diabetes, there were no statistically significant differences.[63] Prospective studies have suggested that with improvement of glycemic control, cognitive impairment also improved.[82] ACCORD-MIND study that reported 40 months of intensive diabetes treatment (compared to standard care) had no benefit on several measures of cognition[83] The current study has once again proved the fact that glycaemic status is a strong predictor of cognitive impairment.

Cognition and diet

Role of diet is documented in both age-related cognitive decline and neurodegenerative cognitive impairment. Dietary fat and high energy compounds seems to be risk factors for cognitive decline whereas fish consumption and cereals are found to reduce cognitive impairment. Vitamin deficiencies especially with B12, folic acid and B6, and folates also seem to have greater impact on cognitive impairment. [84,85]

In this study, the subgroup analysis based on diet showed no significant difference in the tests used for assessing cognition. A clearer analysis of the diet pattern or a programmed diet based study on cognitive functions is needed for getting concrete evidence.

Cognition and physical activity

Physical activity could indirectly affect cognitive functions by influencing mediators that provide physical and mental resources for cognition: for example, (a) by enhancing physical energy levels by increasing sleep quality and enabling the intake of adequate amounts of food to maintain energy, (b) preventing or postponing disease states such as diabetes and (c) providing mechanisms that control anxiety and depression.[86] Active physical life keeps the blood sugar values in check and prevents excursions in hyperglycemia The protective effect exercise over cognition is proved by previous researches. [73,87]

In this study, the beneficial effect of exercise and physical activity is not significantly noticed. The reason may be that the duration and type of exercise could not be quantified and correlated with the cognitive functions.

Cognition and smoking

In many cross-sectional studies poorer performance in smokers was reported for auditory-verbal learning and/or memory[88,89], working memory[90] , executive functions[89] , general intellectual abilities[91], visual search speed[92,93], processing speed and cognitive flexibility [89,93] and global cognitive function[93] (e.g., brief mental status examinations such as the MMSE). The level and chronicity of smoking, as reflected in the number of cigarettes smoked per day, duration of smoking over lifetime, and/or dose-duration (i.e., pack-years) were inversely related to various domains of neurocognition in adults across a wide age range.[94,95] A

detailed review of may cross-sectional studies by Timothy et al[96] has concluded that chronic cigarette smoking appears to be associated with demonstrable abnormalities in brain neurobiology and neurocognition.

This study showed that participants who are smokers have poorer MMSE scores suggesting that smoking affects cognition in a detrimental way.

Cognition and alcohol

Alcohol consumption is said to have a J shaped relationship with cognitive function meaning that light-to-moderate consumption has shown to increase cognition whereas heavy consumption seems to be detrimental to cognition.[97] Similar to smoking, alcohol seem to affect cognitive function in a detrimental way. Apart from its effects on neurocognition, chronic alcoholism also leads to deficiencies of vitamins like thiamine, niacin and Vitamin B12, all of which are prone to impair cognition[98]

In the current study, the cognitive impairment is found to be greater in alcoholics when compared to non-alcoholics. The quantification is not perfectly done in this study hence could not comment further.

Cognition and literacy level.

Level of education is a strong influencing factor in the assessment of cognitive functions. Folstein, McHugh, and Fanjiang have classified the scoring pattern of MMSE based on level of education.[45] Elizabeth Guerrero et al[99] have

documented that higher the level of education and younger the age, better is the performance in the cognitive tests. Dahlke et al[100] has stated that MMSE can be used as a proxy to assess literacy because it has a face value of health literacy measure. In this study, the influence of literacy on cognitive dysfunction was analyzed using MMSE as well as visual and auditory reaction time. It was found that as the level of literacy increases, the cognitive function scores also increase. This clearly proves the significance of education on cognition.

Summary

SUMMARY OF THE STUDY

- The prevalence of cognitive impairment found in this study is 62.8 %, of which 41.3 % were having mild cognitive impairment and 21.5% were having severe cognitive impairment.
- The median scores of MMSE in this study was found to be very less 22 with the range of 10 – 30
- The mean visual reaction time found in our study participants was 522.49 ± 198.88 and 538.09 ± 194.27 milliseconds for green and red light, respectively. Mean auditory reaction time was found to be 439.38 ± 174.31 milliseconds.
- Diabetic men were found to be having better cognition compared to women (MMSE score were higher; visual and auditory reaction time were lower)
- Fasting blood sugar showed negative correlation with MMSE scores. Similarly, HBA1C, fasting and post-prandial blood sugar levels showed strong positive correlation with visual and auditory reaction time emphasizing that poor glycemic control is associated with cognitive impairment.
- Duration of diabetes was not significantly associated with cognitive impairment.
- As BMI increased, the cognitive impairment was found to be less with better MMSE scores proving that obesity has a protective role over cognition

- Diet and physical activity were not associated significantly with cognitive impairment.
- Cognitive impairment was significantly greater in smokers (as evidenced by decreased MMSE scores) and alcoholics (as evidenced by decreased MMSE scores and increased reaction time)
- Level of Literacy is a stronger influencer of cognitive function which is evident in both MMSE scores and reaction time.

Limitation

LIMITATIONS

- The Neuro-cognitive tests were not supported by objective evidence for structural and functional damage of the brain like MRI, SPECT, PET or other electro-diagnostic tests like p300.
- Insulin resistance could have been measured to relate that to glycemic indicators.
- The influence of other risk factors like thyroid dysfunction, hormonal factors, vitamin D, B12, B2 and folic acid has not been quantitatively assessed.

Recommendations

FUTURE RECOMMENDATIONS

1. Multiple neuro-cognitive tests can be done to assess various domains of cognition
2. Objective assessment of cognition can be included to have morphological and functional evidence.
3. Assessment of lipid profile, hormonal status, vitamin level estimation, Apo E expression and insulin resistance can be done to support the observation.

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Annexures

ANNEXURE - 1

DHANALAKSHMI SRINIVASAN MEDICAL COLLEGE AND HOSPITAL
SIRUVACHUR, PERAMBALUR – 621113, Tamilnadu, India.

Institutional Ethics Committee (Human Study) -IECHS

Document - 11
Date: 19-12-2015

No. IECHS/DSMCH/021/Version_1
No. IRCHS/DSMCH/028

CERTIFICATE OF ETHICS APPROVAL

This is to certify that, the VERIFIED DISSERTATION PROJECT No. **IECHS/DSMCH/021** entitled **"Assessment of cognitive function in type 2 diabetic patients in a rural tertiary healthcare facility"**, submitted by Dr. R.V.S. Velmurugan, Postgraduate student, Dr. S. Venkiduswamy (Guide), Dr. M. Anbarasi (Co-guide), Dr. D. Venkataraman (Co-guide), Dr. S.R.Nirmal (Co-guide), is **APPROVED** by the Institutional Ethics Committee (Human Studies), at its meetings held on **18-12-2015**, and decision taken by all the IECHS members as per the Standard Operating Procedures of the IECHS as well as various Ethical Guidelines, and Certificate of Ethics Approval to be issued to the Principal Investigator, with advise to the PI that, **If any modification on the Verified and Approved Dissertation Protocol done by the Principal investigator, it will be mandatory to submit the modified details WITHIN SEVEN DAYS to the IEC (Institutional Ethics Committee) and IRC (Institutional Research Committee) both,** and if you get clearance regarding modified protocol, then you will be authorized to continue the Research work. **The IECHS has right to give a letter to stop/terminate this study any time.**

Signature
Member Secretary
Institutional Ethics Committee on
Human Studies (IECHS)

Name: Dr. Surendra Kumar Bonkth
Date: 20-12-2015

Signature
Chairman
Institutional Ethics Committee on
Human Studies (IECHS)

Name: P. DHARUMARAJAN JOSEPHAN
Date: 20.12.2015

Copy to:
*Principal Investigator. *Member Secretary, IRCHS. *Office copy of the IECHS.

ANNEXURE - 2

ஒப்புதல் படிவம்

2ன் பாகம் 2 – பங்கேற்பாளரின் ஒப்புதல் படிவம்

பங்கேபாளரின் பெயர்:
முகவர்:

அலைபேசி எண்:

ஆராய்ச்சியியின் தலைப்பு :

"ஊரக முன்றாம் நிலை மருத்துவமனையில் இரண்டாம் வகை நீரிழிவு நோயாளிகளின் அறிதிறன் மற்றும் உறக்க தரத்தை மதிப்பீடு செய்யும் ஆய்வு"

இந்த ஆராச்சிலையப் பற்றிய அனைத்து விபரங்களும் என்க்கு எழுத்து மற்றும் வாய் மொழியாக எனது தாய்மொழியில் முழுமையாக விளக்கப்பட்டுள்ளது. இவ்வாராய்ச்சியை முழுமையாக புரிந்துகொண்டேன் என்றும், இவ்வாராச்சில்யப் பற்றிய கேள்விகளை எழுப்புவதற்கு எனக்கு தகுந்த வாய்ப்பளிக்கப்பட்டது என்றும் உறுதியளிக்கிறேன். இவ்வாராய்ச்சியில் நான் பங்கு பெறுவது வேண்டுமானாலும் விலகிக்கொள்ளலாம் என்றும் புரிந்துகொண்டேன். இவ்வாராய்ச்சியில் வரும் முடிவுகள் மற்றும் அளவுகளை அறிவியலின் முன்னேற்றத்திற்காக பயன்படுத்தற்கு எந்தவிதத் தடையும் ஏற்படுத்தமாட்டேன் என்றும் உறுதி கூறுகிறேன். மேலும் இவ்வொப்புதல் படிவம் 2ல் பகுதி-I "ஆராய்ச்சியில் பங்குபெறுவோருக்கு தகவல்கள்" என்ற படிவத்தின் ஒரு நகலை பெற்றுக் கொண்டேன். நான் இவ்வாராய்ச்சியில் பங்குகொள்வதற்கு முழுமனதுடன் சம்மதிக்கிறேன்.

பங்கேற்பவர் கையொப்பம் தேதி:

சாட்சியாளர் கையப்பம் தேதி:

ANNEXURE – 3

PATIENT ID CARD (Study)

Date of Screening / Study :

Age/Sex :

PIN No. :

Husband / Father's Name/ C/O :

Case / Control :

Address :

Contact No/ Email ID :

DATE OF REGISTRATION/SCREENING WITH WRITTEN INFORMED CONSTENT

Name of the Patient :

Age in year : Sex(Encircle) 1. Male 2. Female 3. Transgender

Community :

Address : S/O / D/O / W/O

Door No. : Street :

Village :

Post office/ Taluk: Panchayat :

Town/City/Dist :

Land Mark :

Contact : MobileNo:

EDUCATION : (Encircle)

1. Illiterate 2. 1-5 Std 3. 6-8 Std 4. 9-10 Std 5. 11-12 Std 6.Diploma 7. Degree

Occupation : (Encircle):

1. Farmer (Own Land) 2. Agriculture / Unskilled Labor 3. Skilled Worker / Employee – Govt
4. Skilled Worker / Employee – Pvt. 5. Self Employed – own Shop / Small Business 6. House Wife
7. Retired 8. Professional / Big Business 9. Unemployed

Monthly Income :

HABITS :(Encircle)

SMOKING : (a) Currently Smoking 1. Yes 2.No

(b)Frequency 1. Daily 2. Occasionally

(c) What do you smoke 1. Cigarette 2. Beedi 3. Others

ALCOCHOL USE : (a) In past one month 1. Yes 2. No

If yes (b) frequently 1. Daily 2. Weekly once 3. Occasionally

(c)Quantity -

SMOKELESS Tobacco : (a) 1. Yes 2. No

If yes (b) Frequency (1) Daily 2. Weekly once 3.Occasionally

DIET : 1. Veg 2. Mixed diet (Non veg)

Physical activity : (a) Have you done any of the following activities that Caused Breathlessness or Increased Heart

Rate apart from your regular work in the past one week?

1. BRISK WALKING 2. JOGGING 3. CYCLING 4. GAMES/SPORTS 5 GYM 6. OTHER 7. NIL ACTIVITY.

(b) If yes, specify how many days per week did you do the above mentioned activity?

PHYSICAL EXAMINATION:

1. Height……..CMS. 2. Weight……KG. 3. Waist……..CMS. 4. Systolic BP……mm Hg
5. Diastolic BP……mm Hg 6. Pulse Rate……/min 7. Spo_2……Percentage.

8. Body Mass Index (BMI) (Calculate Tick)

$$BMI = \frac{\text{wt in Kg}}{(\text{Ht in meters})^2}$$

Classification	BMI	
Normal	18.5 – 22.9	
Over Weight	23 – 24.9	
Obese	25 – 29.9	
Very Obese	≥ 30	

9. PRESENTING C/O :

1. Polyuria :
2. Polyphagia
3. Polydipsia
4. Slow or non healing ulcer
5. Disturbed Sleep - Quantity Quality

10. PAST HISTORY :

1. Hypertension/CAHD	:	Yes/No /Yes/No
2. Diabetes mellitus	:	Yes/No
3. Claudicating Pain/Peripheral vascular disease	:	Yes/ No
4. Chronic Kidney Disease	:	Yes/No
5. Liver Disease	:	Yes/No
6. Trauma / Head Injury	:	Yes/No
7. Stroke / TIA	:	Yes/No
8. Epilepsy / Neuro Muscular Disorder	:	Yes/ No
9. Sedatives / Antidepressants/Anti psychotics	:	Yes/No
10. Hypothyroidism	:	Yes/No
11. Any other Auditory / Visual / Speech Defects	:	Yes / No

12. Any other local Pathology that interfere with the test modality :Yes/ No

11. FAMILY HISTORY :

1. Hypertension/CAHD	:	Yes/No / Yes/No
2. Diabetes mellitus	:	Yes/ No
3. Chronic Kidney Disease	:	Yes/ No
4. Stroke / TIA	:	Yes/No
5. Epilepsy / Neuro Muscular Disorder	:	Yes/ No
6. Psychiatric illness	:	Yes/ No
7. Any other Specify		:

12. LIFE STYLE MODIFICATION / AWARENESS:

1. Cessation of Smoking / Alcohol abstinence	
2. Use low salt	
3. Restrict Non veg (Red Meat)	
4. Uses Less fried food / Less Oil	
5. Restrict simple Sugar	
6. Increase intake of vegetables and fruits	

7. Avoid over eating / over weight	
8. Increase Physical activity	
9. Reduce Stress	
10. Use of MCR foot wears	
11. Regular follow up Treatment	
12. Self Medication	

GENERAL EXAMINATION

Consciousness : Yes/No

Orientation : Yes/ No

Pallor : Yes/No

Jaundice : Yes/ No

Clubbing : Yes/No

Pedal Edema : Yes/ No

SYSTEMIC EXAMINATION :

Cardiovascular Examination :

Respiratory Examination :

Abdomen :

Central Nervous system :

Eyes :

ENT :

ANNEXURE – 4

அறிவாற்றல் மதிப்பீடு (Mini Mental State Examination)

1.

I. தற்போது எந்த வருடம்?..... எண்ணிக்கை ...../1
II. தற்போது என்ன சீசன்?..... எண்ணிக்கை ...../1
III. தற்போது என்ன மாதம்?..... எண்ணிக்கை ...../1
IV. இன்றைக்கு என்ன தேதி?..... எண்ணிக்கை ...../1
V. இன்றைக்கு என்ன கிழமை?..... எண்ணிக்கை ...../1.
VI. தற்போது எந்த வருடம்?..... எண்ணிக்கை ...../1

2.

I. நாம் எந்த நாட்டில் உள்ளோம்? ..... எண்ணிக்கை ...../1
II. நாம் எந்த மாநிலத்தில் உள்ளோம்? ..... எண்ணிக்கை ...../1.
III. நாம் எந்த ஊரில் உள்ளோம்? ..... எண்ணிக்கை ...../1
IV. வீடு - எந்த முகவரியில் உள்ளது? ..... எண்ணிக்கை ...../1.
V. மருத்துவமனையின் எந்தப்பகுதியில் உள்ளோம்?.....எண்ணிக்கை ...../1

3. நான் மூன்று பொருட்களின் பெயரைச் சொல்வேன். சொல்லி முடித்தவுடன் அதே போன்று சொல்ல வேண்டும். மேலும் அதை திரும்பவும் ஒரு சில நிமிடங்கள் கழித்து சொல்லச் சொல்வேன்.

பந்து / கார் / மனிதன்

கண்ணாடி/ வயல் / சிவப்பு

(ஒரு வினாடி கால அளவில் ஒவ்வொன்றாகக் கூறவும்).எண்ணிக்கை ...../3

4. நீங்கள் நூறிலிருந்து பின்னோக்கி 7, 7 ஆகக் கழித்துச் சொல்லவும்.

(93,86,79,72,65)

(அல்லது)

சொல்லும் வார்த்தையை பின்னோக்கிச் சொல்லவும்

(கடிகாரம், குடும்பம்) எண்ணிக்கை ...../5

5.சற்று முன் உங்களிடம் மூன்று பொருட்களின் பெயரைச் சொல்லி ஞாபகம் வைத்துக் கொள்ளச் சொன்னேன். அவற்றை திரும்பவும் சொல்லவும். எண்ணிக்கை ...../3

6.எதிரில் உள்ளவரிடம் சாதாரண இரு பொருட்களை காட்டி பெயரிடச் சொல்லவும்.

கை கடிகாரம் , பென்சில் எண்ணிக்கை ...../2

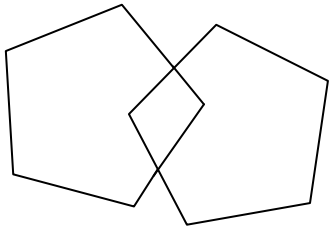
7.நீங்கள் நான் சொல்லும் வார்த்தைகளை மறுபடியும் சொல்லவும்.
(இல்லை, இருக்கலாம், உடன், இல்லாவிடில், ஆனால்) எண்ணிக்கை ...../2

8. ஒரு காகிதத்தை எடுத்து எதிரில் உள்ளவரிடம்
1. எடுக்கச் சொல்லவும் (வலது கை அல்லது இடது கை பழக்கம் அறிந்து கொள்ளவும).
2.இரண்டாக மடிக்கச் சொல்லவும்.
3. தரையில் போடச் சொல்லவும். எண்ணிக்கை ...../3

9.இதைப் படித்து அதில் இருப்பது போல் செய்யவும். (கண்களை மூடவும்) எண்ணிக்கை ...../1

10. எதைப் பற்றி வேண்டுமானாலும் ஒரு முழுமையான வாக்கியத்தை பெயர், வினைச் சொல் ஒரு வாக்கியம் எழுதவும். எண்ணிக்கை ...../1

11. இந்த படத்தைப் பார்த்து வரையும்.
வெற்றுக் காகிதம், அழிப்பான் மற்றும் பென்சில் கொடுத்து வரையச் சொல்லவும். பத்து முனைகள். இரண்டும் குறுக்காக வெட்டிக் கொள்ள வேண்டும். நேரம் .....(ஒரு நிமிடம்)எண்ணிக்கை ...../1



Data sheet for Visual and Auditory reaction times

Date: Time:

Name: Age/Sex: Dominant hand: Right/Left

S.No	VISUAL REACTION TIME		AUDITORY REACTION TIME
	GREEN	RED	
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Data collection procedure

Master Chart

Education	Occupation	Smoking	Alcohol	Smokeless Tobacco	Diet	hysical activit	Ht	Wt	BMI	WC	BP	DBP	PR	PO2	Hb	Hb A1C	FBS	PPBS	ation of diabe	MMSE	VRT_Green	VRT_Red	Aud RT
nior High sch	House wife	No	No	No	Mixed Diet	No	1.65	59	21.7	93	110	70	80	99	10.8	9.8	174	324	3.0	25	406.3	376.4	374.7
Diploma	Unskilled	Yes	Yes	No	Mixed Diet	No	1.65	59	21.7	87	110	80	96	99	9.2	8.6	168	333	1.0	27	390.5	572.8	306.4
Elementary	House wife	No	No	No	Mixed Diet	No	1.55	58	24.1	101	150	80	80	99	8.2	7.6	99	123	3.0	22	937.3	910.1	916.4
Illiterate	Unskilled	No	No	No	Veg	No	1.5	62	27.6	106	110	80	86	99	9.6	10.1	196	348	3.0	16	1001.5	775.1	752.4
nior High sch	Self-employed	Yes	Yes	No	Mixed Diet	No	1.58	55	22.0	92	100	60	68	99	10.1	11.7	180	341	15.0	18	576.9	566.2	604.3
High school	Self-employed	No	No	No	Mixed Diet	No	1.54	70	29.5	96	130	78	76	99	12	10.0	222	370	4.0	23	573.2	512.9	484.8
Elementary	Unskilled	No	No	No	Veg	No	1.7	74	25.6	95	130	90	80	99	10.2	9.8	123	221	20.0	25	533.4	438.8	323.3
nior High sch	Unskilled	No	Yes	Yes	Mixed Diet	No	1.62	54	20.6	86	136	78	94	99	9.4	7.7	152	322	5.0	25	352.1	422.3	315.5
High school	Self-employed	No	No	No	Mixed Diet	Yes	1.56	70	28.8	90	130	90	76	98	10.6	9.0	110	209	2.0	27	542.7	634	342.1
Degree	Unemployed	No	Yes	No	Mixed Diet	Yes	1.56	60	24.7	89	110	70	80	99	12.4	6.3	104	127	1.0	30	383.7	361	296.6
nior High sch	House wife	No	No	No	Mixed Diet	No	1.54	43	18.1	77	150	90	78	97	9.3	7.6	140	180	1.0	21	770.6	734.2	569.1
Elementary	House wife	No	No	No	Mixed Diet	Yes	1.44	66	31.8	112	180	100	80	99	14	6.7	140	270	2.0	23	507.8	565.1	462.1
nior High sch	House wife	No	No	No	Mixed Diet	No	1.5	71	31.6	114	150	80	86	99	9.2	9.1	102	245	9.0	30	288.3	351.5	292.4
Illiterate	Unskilled	No	Yes	No	Mixed Diet	Yes	1.58	73	29.2	94	160	110	80	99	8.6	6.2	110	160	6.0	23	346.5	314.3	270.6
nior High sch	Unskilled	No	No	No	Mixed Diet	No	1.62	72	27.4	100	120	80	98	99	11.6	12.6	363	520	9.0	27	296.2	397.4	354
High school	House wife	No	No	No	Mixed Diet	Yes	1.48	95	43.4	114	150	90	80	99	12	7.1	140	200	1.0	29	317.4	319.6	294.8
Elementary	Unskilled	Yes	Yes	No	Mixed Diet	No	1.69	85	29.8	103	100	60	90	99	12	12.9	379	688	15.0	23	390	427.9	599.2
High school	Unskilled	No	No	No	Mixed Diet	No	1.54	71	29.9	104	110	60	86	99	14.6	5.4	188	359	5.0	26	556.7	562.2	490.5
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.44	55	26.5	68	130	80	70	99	8.6	8.3	398	557	4.0	16	531.5	563.8	435
gher seconda	House wife	No	No	No	Mixed Diet	No	1.52	68	29.4	103	140	80	80	99	12.2	8.0	184	344	6.0	24	562.8	592.8	425.4
Elementary	Self-employed	Yes	Yes	No	Mixed Diet	No	1.62	90	34.3	110	160	80	90	99	13.8	6.7	128	190	1.0	19	489.4	483	466.7
Elementary	Unskilled	Yes	Yes	No	Mixed Diet	No	1.5	51	22.7	83	130	80	84	99	9.8	7.9	242	316	11.0	21	973.7	908.4	816.8
Elementary	Unskilled	No	No	No	Mixed Diet	Yes	1.59	55	21.8	84	150	100	80	99	10.8	6.1	209	275	12.0	19	767.4	936	564.9
Illiterate	Unskilled	No	Yes	Yes	Mixed Diet	Yes	1.61	69	26.6	101	90	70	80	99	14.2	7.2	300	409	5.0	17	722.2	726.7	688.8
Elementary	Self-employed	No	No	No	Mixed Diet	Yes	1.47	46	21.3	83	110	60	80	99	13.6	9.6	137	279	4.0	23	527.6	569.9	419
Illiterate	Farmer	No	No	No	Veg	Yes	1.52	70	30.3	100	160	100	74	99	14.2	6.2	107	154	4.0	17	481.8	493.7	356.1
Illiterate	House wife	No	No	No	Veg	No	1.42	45	22.3	88	110	60	82	98	12	7.0	110	186	5.0	19	437.9	492.1	303.9
High school	Unskilled	No	No	No	Mixed Diet	No	1.61	71	27.4	98	150	90	98	99	15.8	7.8	147	204	2.0	28	336.1	404.7	394.9
Elementary	Unskilled	No	No	Yes	Mixed Diet	No	1.5	58	25.8	84	110	80	90	98	10	6.6	129	154	1.0	22	445.3	450.1	462.2
High school	Unskilled	No	No	Yes	Mixed Diet	No	1.75	53	17.3	93	120	80	80	98	14.3	7.2	137	192	1.0	24	449.7	461.1	290.2
Illiterate	House wife	No	No	No	Mixed Diet	No	1.46	46	21.6	71	110	70	86	99	9.2	9.8	180	280	6.0	14	539.1	838.7	385.9
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.55	63	26.2	88	130	78	76	96	10.4	7.2	153	210	10.0	21	497.7	526.6	337.8
Illiterate	House wife	No	No	No	Mixed Diet	No	1.6	60	23.4	88	130	80	86	99	8.9	10.0	259	469	5.0	21	364.3	341.2	374.8
nior High sch	Unskilled	No	Yes	No	Mixed Diet	No	1.62	56	21.3	81	140	86	78	99	11.8	9.9	266	380	8.0	20	362.1	357.6	441.4
nior High sch	Farmer	No	Yes	No	Mixed Diet	No	1.73	65	21.7	97	130	80	80	99	13.9	9.2	210	380	10.0	28	430.6	596.4	400.4
Elementary	Unskilled	No	No	Yes	Mixed Diet	No	1.64	70	26.0	88	160	84	98	99	10.6	11.7	280	440	7.0	16	541.2	493.4	440.7
Illiterate	Unskilled	No	No	Yes	Mixed Diet	No	1.67	60	21.5	88	170	80	84	98	13	12.2	260	480	5.0	18	532.1	590.7	493.4
nior High sch	House wife	No	No	No	Mixed Diet	No	1.56	44	18.1	73	126	80	78	98	12.5	9.1	220	376	1.0	27	432.5	482.3	323.3
Illiterate	Unskilled	No	Yes	Yes	Mixed Diet	No	1.6	73	28.5	102	140	80	78	98	14.4	9.0	160	280	1.0	18	510.5	530	425.4
nior High sch	Self-employed	Yes	Yes	Yes	Mixed Diet	No	1.52	50	21.6	84	110	80	78	99	13.3	8.0	159	436	1.5	25	310.1	377	413.7
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.45	75	35.7	102	116	70	78	99	12.4	6.1	75	120	3.0	15	278.9	316.5	328.1
gher seconda	Unskilled	Yes	Yes	Yes	Mixed Diet	No	1.88	80	22.6	92	136	84	68	99	12.9	7.4	193	257	1.5	25	436.6	494.2	321.2
Degree	Skilled	Yes	Yes	No	Mixed Diet	No	1.68	50	17.7	96	110	80	70	98	10.6	9.1	240	423	1.0	25	1022	1188	508.2
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.64	51	19.0	80	100	80	78	99	12.8	9.2	260	392	23.0	25	261.9	261.1	283.7
nior High sch	Unskilled	No	No	No	Veg	No	1.62	90	34.3	114	136	90	68	99	9.2	6.2	72	102	4.0	20	699.3	654.7	335.8
nior High sch	Unskilled	Yes	Yes	No	Veg	No	1.62	42	16.0	72	126	78	98	97	14.7	9.2	345	373	20.0	22	331.8	356.2	739.7
nior High sch	Unskilled	No	Yes	No	Mixed Diet	No	1.59	40	15.8	70	110	66	92	98	7.7	8.9	235	368	1.0	25	374.5	422.5	701
Elementary	Unskilled	No	No	Yes	Mixed Diet	No	1.78	55	17.4	78	120	80	80	98	12.4	9.1	220	336	1.0	17	350.1	318.9	188.3
nior High sch	Unskilled	No	No	No	Mixed Diet	No	1.52	55	23.8	94	110	80	84	96	12.7	10.5	292	485	4.0	25	352.5	421.5	273.6
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.5	49	21.8	74	110	70	80	97	8.5	7.4	133	184	20.0	12	375.9	490.4	379.9
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.5	63	28.0	103	130	80	80	99	13.2	8.2	180	228	20.0	14	485	389	286
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.48	61	27.8	89	110	80	70	98	12.6	10.0	280	473	[1	21	401.3	507	311.8
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.3	40	23.7	73	110	80	86	99	10.7	7.1	137	207	9.0	19	508.1	471.1	453.2
Elementary	Self-employed	No	No	No	Mixed Diet	No	1.45	70	33.3	100	110	90	90	99	11.2	9.5	270	320	3.0	18	399.2	264.1	356.4
gher seconda	Skilled	No	No	No	Mixed Diet	No	1.65	65	23.9	90	140	86	74	98	14.1	8.0	217	317	5.0	26	255.9	344.9	222
High school	Farmer	No	No	No	Veg	No	1.64	80	29.7	87	130	80	80	99	8.6	7.8	178	263	5.0	28	415.6	489.6	382.5
Elementary	Unskilled	No	No	No	Veg	No	1.61	50	19.3	79	140	90	80	99	14.3	7.2	148	224	1.0	13	282.6	380.3	236.9
High school	Unskilled	No	No	No	Mixed Diet	No	1.65	80	29.4	118	140	80	80	99	11.7	6.6	122	198	15.0	27	563.7	547.7	378.8
High school	Unskilled	No	Yes	No	Mixed Diet	No	1.68	53	18.8	80	130	80	90	98	12.9	8.1	203	335	25.0	20	428.6	470.8	407.4
Illiterate	Unskilled	No	No	Yes	Mixed Diet	No	1.47	49	22.7	82	140	90	94	99	9.9	9.2	283	378	1.0	21	346.9	342.4	266.3
Elementary	Self-employed	No	No	No	Mixed Diet	No	1.53	68	29.0	96	130	80	90	99	9.7	7.3	228	296	1.0	20	549.2	516.3	798
High school	Unskilled	No	No	No	Mixed Diet	No	1.6	83	32.4	110	140	90	90	99	11.4	6.5	132	178	2.0	19	499.2	459.3	600
Degree	Self-employed	No	Yes	No	Mixed Diet	Yes	1.62	52	19.8	82	110	80	98	99	9.4	10.4	256	326	3.5	28	626.4	899.3	406.7
gher seconda	Unskilled	Yes	Yes	No	Mixed Diet	No	1.68	41	14.5	70	110	80	86	99	15.1	8.2	180	221	1.0	29	395.6	486.1	307.9
nior High sch	House wife	No	No	No	Mixed Diet	No	1.55	65	27.1	112	110	70	80	99	13.2	7.0	156	246	15.0	28	533.1	543.1	417.7
nior High sch	Unskilled	Yes	Yes	No	Mixed Diet	No	1.63	70	26.3	80	143	92	140	99	14.1	8.1	372	418	5.0	27	470.1	430	484
Illiterate	Unskilled	No	Yes	No	Mixed Diet	Yes	1.78	70	22.1	90	150	80	100	98	10.8	10.0	220	348	10.0	19	292.9	345.8	264.4
Illiterate	Skilled	No	No	Yes	Mixed Diet	Yes	1.74	54	17.8	85	112	66	76	99	12.8	6.8	140	178	1.0	22	384.4	422.3	292
nior High sch	Farmer	No	No	No	Mixed Diet	No	1.84	74	21.9	97	120	80	88	99	10.8	6.7	120	146	1.0	27	765.8	599.8	389.4

High school	House wife	No	No	No	Mixed Diet	No	1.59	67	26.5	80	152	82	94	99	16.2	7.8	176	220	2.0	27	789.9	776	285.5
High school	Farmer	No	No	No	Mixed Diet	Yes	1.54	37	15.6	77	130	80	80	99	12.1	7.5	142	210	4.0	21	529.7	515.7	343.5
Illiterate	House wife	No	No	No	Mixed Diet	Yes	1.57	65	26.4	99	130	80	94	99	12.5	8.8	189	310	1.0	19	486.5	525.4	563.4
Elementary	Farmer	No	No	No	Mixed Diet	Yes	1.78	60	18.9	90	128	80	80	98	11.4	9.8	220	362	2.0	22	447.7	421.9	440.3
gher seconda	Skilled	No	No	No	Veg	Yes	1.61	56	21.6	90	140	86	70	98	12.6	8.3	148	319	5.0	27	471.8	441.8	475.2
High school	Farmer	No	No	No	Mixed Diet	No	1.74	64	21.1	95	100	70	78	99	13.1	7.4	138	198	2.0	22	296	263.9	278.6
Illiterate	Unskilled	No	Yes	Yes	Mixed Diet	No	1.67	79	28.3	107	120	80	80	99	10.3	8.1	377	309	3.0	18	323.8	337.1	279.2
nior High sch	Skilled	Yes	Yes	No	Mixed Diet	No	1.7	86	29.8	92	130	80	86	99	14	8.2	167	219	6.0	26	489.8	582.1	538.1
High school	Unskilled	No	Yes	No	Mixed Diet	No	1.62	52	19.8	77	130	86	78	98	13.7	9.2	198	280	5.0	26	511.9	529.2	436.2
Elementary	House wife	No	No	No	Mixed Diet	No	1.55	64	26.6	90	110	60	68	99	8	8.4	168	243	7.0	19	517.3	476.4	323.8
Illiterate	House wife	No	No	No	Mixed Diet	No	1.54	63	26.6	102	126	80	86	99	6.2	8.3	77	218	1.0	14	376.9	408.9	306.8
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.52	40	17.3	73	130	80	80	99	9.6	10.9	313	468	4.0	18	976.4	863.9	447.2
nior High sch	Skilled	Yes	No	No	Mixed Diet	No	1.64	60	22.3	86	136	84	92	98	15.2	7.4	142	180	12.0	25	354.8	496.6	467.4
Illiterate	Unskilled	No	No	No	Mixed Diet	Yes	1.52	60	26.0	86	150	80	78	98	11.9	9.8	198	310	10.0	16	549.3	564.1	351.9
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.6	60	23.4	84	140	90	80	98	7	9.1	114	139	15.0	20	519.6	600.3	459.5
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.34	39	21.7	82	120	70	80	99	13.1	9.8	221	328	3.0	19	363.4	460.8	363.6
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.56	65	26.7	88	110	80	84	99	8.5	6.3	120	168	1.0	17	359.8	307.5	276
nior High sch	Skilled	No	No	No	Veg	Yes	1.64	73	27.1	105	150	98	76	99	10.7	7.6	170	210	15.0	23	396.2	444.1	375.7
Elementary	Unskilled	Yes	Yes	Yes	Mixed Diet	No	1.62	48	18.3	75	120	90	84	98	9.8	8.2	152	186	1.0	20	328	400.7	259
High school	Unskilled	Yes	Yes	No	Mixed Diet	No	1.75	60	19.6	87	140	90	90	98	10	8.5	178	218	15.0	25	523.3	521.5	345.8
nior High sch	Unskilled	No	Yes	Yes	Mixed Diet	No	1.68	48	17.0	65	100	70	80	98	9.7	7.9	139	208	10.0	23	638.2	538.1	288.8
Elementary	Unskilled	No	Yes	No	Mixed Diet	No	1.62	55	21.0	84	130	70	78	98	13.6	7.5	128	200	3.0	16	930.4	872.6	749
Elementary	House wife	No	No	No	Mixed Diet	Yes	1.43	70	34.2	92	126	84	88	99	11.1	6.3	103	142	1.0	22	308.4	417.3	617.9
nior High sch	Skilled	No	No	No	Mixed Diet	Yes	1.66	70	25.4	98	100	70	76	98	12.8	10.1	279	348	1.0	28	552.3	544.2	389.4
High school	House wife	No	No	No	Mixed Diet	No	1.42	60	29.8	100	140	80	80	99	12.2	7.9	208	318	8.0	26	455.8	637.6	368.4
Diploma	Skilled	Yes	Yes	No	Mixed Diet	No	1.64	68	25.3	100	110	80	80	98	10.1	6.5	116	156	8.0	29	463.9	433.7	261.4
Elementary	Unskilled	Yes	Yes	No	Mixed Diet	No	1.62	60	22.9	80	130	80	90	99	11	7.8	189	256	7.0	24	410.4	375.1	332.3
Illiterate	Unskilled	No	Yes	Yes	Mixed Diet	Yes	1.57	49	19.9	68	130	80	98	99	12.8	9.0	210	340	3.0	13	439.9	423.2	315.5
Elementary	House wife	No	No	No	Mixed Diet	Yes	1.48	60	27.4	93	126	78	90	99	8.7	6.1	108	165	8.0	26	446.4	577.4	463.3
nior High sch	House wife	No	No	No	Mixed Diet	No	1.5	91	40.4	117	110	80	80	98	12.2	6.8	102	142	2.0	24	422.9	442.2	401
Illiterate	Unskilled	No	No	No	Mixed Diet	Yes	1.49	40	18.0	83	150	100	80	99	13	6.3	98	136	4.0	15	834.2	783.9	722
Elementary	House wife	No	No	No	Mixed Diet	No	1.36	57	30.8	92	100	60	80	98	12.1	8.0	167	218	1.0	21	429.8	439.4	242.3
High school	House wife	No	No	No	Mixed Diet	No	1.53	63	26.9	97	110	60	80	99	13.2	7.8	168	220	4.0	25	398.6	403.6	316.2
Diploma	Skilled	No	No	No	Mixed Diet	No	1.76	95	30.7	119	130	80	80	99	11.6	5.7	132	151	2.0	30	522.4	539.6	319.4
Elementary	House wife	No	No	No	Veg	Yes	1.52	51	22.1	96	140	100	86	99	12.8	8.7	193	374	6.0	21	596.1	652.5	479
gher seconda	House wife	No	No	No	Mixed Diet	No	1.71	81	27.7	114	110	70	80	98	12.3	8.3	208	282	3.0	30	462.5	455.7	313.2
High school	Unskilled	Yes	Yes	No	Veg	Yes	1.62	65	24.8	92	130	80	68	99	10.3	5.2	89	130	25.0	29	619.4	785.6	504
Illiterate	House wife	No	No	No	Mixed Diet	No	1.36	42	22.7	90	100	60	80	99	11.8	5.3	87	178	2.0	15	366.2	382.2	220
Elementary	Unskilled	Yes	Yes	No	Mixed Diet	No	1.72	80	27.0	91	110	70	68	99	8.5	6.1	90	126	1.0	20	241.2	223.7	269.9
Illiterate	Self-employed	No	No	No	Mixed Diet	Yes	1.45	49	23.3	95	130	90	80	99	11	10.3	230	289	2.0	17	311.5	461.4	363.1
Illiterate	Unskilled	Yes	Yes	No	Mixed Diet	No	1.62	54	20.6	82	130	80	68	99	13.6	10.8	314	512	1.0	22	406.8	380	260.2
Elementary	Unskilled	No	Yes	Yes	Mixed Diet	No	1.7	57	19.7	92	140	80	86	99	14.4	5.8	125	149	1.0	20	610	545.8	378.5
nior High sch	Skilled	No	Yes	Yes	Mixed Diet	Yes	1.74	75	24.8	96	140	86	70	99	12.8	6.2	149	156	3.5	24	275.3	325	391.7
Illiterate	Unskilled	No	No	No	Mixed Diet	Yes	1.56	65	26.7	96	130	80	90	99	12.7	7.1	156	260	2.0	21	622	585.1	575.7
Illiterate	Unemployed	No	No	No	Mixed Diet	No	1.35	36	19.8	80	100	80	80	99	7	8.2	167	298	6.0	17	585.5	616.6	444.1
nior High sch	House wife	No	No	No	Mixed Diet	Yes	1.47	57	26.4	98	140	86	98	99	9	72.0	146	198	4.0	19	499.7	413.8	425.7
Elementary	Unskilled	Yes	Yes	No	Mixed Diet	No	1.56	60	24.7	98	130	80	80	99	14.6	6.3	120	142	4.0	17	527.8	529.5	579.9
Illiterate	House wife	No	No	No	Mixed Diet	No	1.5	52	23.1	90	130	96	88	99	7.8	8.9	156	210	13.0	24	795.6	800.6	960.5
High school	House wife	No	No	Yes	Mixed Diet	Yes	1.67	67	24.0	102	140	80	90	99	11.5	9.5	227	373	15.0	23	377	373.7	266.6
nior High sch	Unskilled	No	Yes	Yes	Mixed Diet	No	1.64	80	29.7	84	130	70	88	99	9.2	7.7	159	228	5.0	24	307.6	360.6	281.7
Illiterate	Unskilled	No	Yes	Yes	Mixed Diet	Yes	1.75	54	17.6	80	140	80	90	99	8.3	8.9	205	310	1.0	16	619.2	671.4	696.2
Illiterate	House wife	No	No	No	Veg	No	1.6	60	23.4	91	136	84	78	99	13.9	6.9	104	142	7.0	18	401.9	400.8	289.5
High school	Unskilled	No	No	No	Mixed Diet	Yes	1.6	60	23.4	84	150	80	78	99	15.3	8.7	156	250	3.0	21	754.3	661.7	505.4
Elementary	House wife	No	No	No	Mixed Diet	No	1.44	47	22.7	80	130	80	70	99	8.4	7.4	116	307	3.0	19	1030.6	1244	1082
Illiterate	House wife	No	No	Yes	Mixed Diet	No	1.54	56	23.6	86	130	70	80	99	11	9.0	283	371	8.0	17	684.1	658.1	371.4
High school	Retired	No	No	No	Mixed Diet	No	1.62	61	23.2	92	110	80	88	99	10.8	8.2	186	263	20.0	23	560.8	731.2	678.2
Illiterate	Unskilled	No	Yes	Yes	Mixed Diet	Yes	1.67	45	16.1	70	110	80	90	99	11.4	7.1	152	198	1.0	19	468.8	504.4	432.9
Illiterate	Unskilled	No	No	No	Mixed Diet	Yes	1.48	50	22.8	85	126	78	80	96	10.9	7.8	148	192	13.0	10	627.7	726.9	983.5
High school	Unskilled	Yes	Yes	No	Mixed Diet	No	1.78	83	26.2	87	110	80	80	99	17.4	7.4	136	167	1.0	25	411.9	361.7	271.9
nior High sch	Unskilled	No	Yes	Yes	Mixed Diet	No	1.64	64	23.8	90	130	76	80	97	11	6.6	98	141	2.0	28	519.1	472.1	438.8
nior High sch	Unskilled	Yes	Yes	Yes	Mixed Diet	Yes	1.68	60	21.3	106	130	80	78	99	10.2	6.9	98	160	2.0	22	349.8	339.9	317
High school	Unskilled	Yes	No	No	Mixed Diet	No	1.65	60	22.0	88	130	80	90	99	12.3	6.4	102	162	3.0	21	973.5	946	1242.5
High school	Unskilled	No	No	No	Mixed Diet	No	1.6	74	28.9	96	110	80	78	99	15.2	9.1	243	416	1.0	24	551.9	603.8	553.2
Degree	Unskilled	No	Yes	Yes	Mixed Diet	No	1.68	54	19.1	83	140	80	90	99	12.4	8.2	162	208	1.0	23	327.6	363.9	396.3
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.62	63	24.0	86	160	80	80	99	11.3	7.4	125	288	1.0	21	395.5	478.3	234.6
Degree	Skilled	No	Yes	No	Mixed Diet	No	1.65	60	22.0	82	110	80	68	98	14.2	6.6	107	212	1.0	30	398.1	384.7	285.7
Elementary	Farmer	No	Yes	Yes	Mixed Diet	Yes	1.59	45	17.8	76	130	80	80	99	12.6	7.3	168	196	4.0	22	284.7	363.5	388.1
High school	Farmer	Yes	No	No	Mixed Diet	No	1.45	50	23.8	92	110	80	70	99	12.6	6.8	122	186	3.0	17	1284.6	1067.4	386.7
Elementary	Farmer	Yes	Yes	No	Mixed Diet	Yes	1.54	60	25.3	92	130	70	80	99	11	7.8	162	201	10.0	17	440.3	508.1	313.9
Diploma	Self-employed	Yes	Yes	No	Mixed Diet	No	1.78	73	23.0	93	150	80	80	99	15.1	8.0	176	228	15.0	29	477.2	450.4	564.6
Elementary	Unskilled	No	No	Yes	Mixed Diet	Yes	1.48	50	22.8	90	110	80	68	99	12.7	5.2	87	132	1.0	15	989.4	804.5	303.8

Illiterate	Unskilled	No	No	No	Mixed Diet	Yes	1.56	52	21.4	90	100	80	80	99	10.3	7.2	188	268	2.0	17	406.3	430.3	468.1
Illiterate	Unskilled	No	Yes	Yes	Mixed Diet	Yes	1.56	80	32.9	116	160	100	86	99	9.8	11.4	350	398	15.0	16	463.6	541	631.5
Elementary	Unskilled	No	Yes	No	Mixed Diet	No	1.7	40	13.8	80	130	90	92	100	12	7.5	168	226	1.0	18	270.7	280.7	213.8
High school	Unskilled	Yes	Yes	Yes	Mixed Diet	Yes	1.53	49	20.9	81	110	80	80	99	11.6	9.8	202	286	25.0	20	572.1	589.9	461.9
High school	Unskilled	No	No	No	Mixed Diet	Yes	1.49	65	29.3	93	140	90	80	99	12.5	9.3	212	314	6.0	21	680.8	647	526.7
High school	House wife	No	No	No	Mixed Diet	Yes	1.51	60	26.3	93	126	70	78	99	11.5	11.1	196	264	6.0	23	444.6	517.2	477.8
igher seconda	Retired	No	No	No	Mixed Diet	No	1.56	63	25.9	92	160	80	84	99	11.7	8.4	164	242	17.0	29	488.2	404.4	452.8
High school	Unskilled	No	No	No	Veg	No	1.47	53	24.5	85	116	76	68	99	13.2	6.8	182	248	11.0	18	438.5	393.6	300.3
Elementary	Unskilled	No	Yes	Yes	Mixed Diet	Yes	1.55	61	25.4	94	146	88	80	99	13.2	7.6	185	285	7.0	21	523.8	500.8	281.1
nior High sch	Skilled	Yes	Yes	No	Mixed Diet	No	1.63	70	26.3	93	146	80	70	99	12.4	8.0	196	276	1.5	27	633.9	510.8	636.8
Illiterate	Unskilled	No	No	Yes	Mixed Diet	No	1.4	50	25.5	91	130	70	80	99	12.3	6.8	174	213	1.0	17	521.3	538.1	654
nior High sch	House wife	No	No	No	Mixed Diet	No	1.68	67	23.7	95	140	90	90	99	12.2	6.4	126	189	1 0.5	28	307.1	390.4	356
Illiterate	Unskilled	No	Yes	Yes	Mixed Diet	No	1.42	55	27.3	80	116	70	80	99	11	7.1	158	202	3.0	18	397.9	476.8	448.8
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.47	46	21.3	83	110	70	80	99	7.6	7.6	162	202	1.0	20	484.7	433.5	652.4
Illiterate	Unskilled	Yes	Yes	Yes	Mixed Diet	No	1.6	60	23.4	89	110	80	90	99	9.8	6.1	139	152	6.0	16	529	525.8	402.3
High school	Unskilled	No	Yes	No	Mixed Diet	No	1.62	55	21.0	84	116	78	70	97	15.5	8.0	322	342	2.0	22	344.4	390.8	556.8
High school	Unskilled	No	Yes	Yes	Mixed Diet	No	1.64	80	29.7	81	110	70	88	99	11.2	6.2	121	148	2.0	22	291.3	270.1	332.8
High school	House wife	No	No	No	Mixed Diet	No	1.46	50	23.5	86	110	70	80	99	9.8	9.5	180	250	1.0	24	602.5	599.4	445.5
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.53	55	23.5	92	150	96	68	99	11	10.8	216	302	8.0	14	830.9	890.2	1050.9
Illiterate	House wife	No	No	No	Mixed Diet	Yes	1.43	64	31.3	104	136	82	84	99	9.8	6.4	118	186	4.0	15	867.6	1001	1084.2
High school	Skilled	No	No	No	Mixed Diet	No	1.58	73	29.2	102	130	80	80	99	11.6	6.1	112	165	1.0	24	363.6	476.1	556.3
Elementary	Unskilled	No	No	Yes	Mixed Diet	No	1.56	58	23.8	95	130	76	80	99	11.7	8.0	186	280	1.0	19	422.6	410.3	526.1
High school	Unskilled	Yes	Yes	Yes	Mixed Diet	No	1.58	63	25.2	92	130	80	80	99	14.7	9.6	202	298	5.0	24	634.4	478.7	538.2
nior High sch	Self-employed	No	No	No	Veg	No	1.56	60	24.7	88	100	60	80	99	8.4	10.6	252	341	5.0	24	554.8	731.5	586
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.6	68	26.6	84	126	84	70	99	12.5	7.5	232	298	4.0	19	736.9	416.1	286.4
High school	Unskilled	No	Yes	Yes	Mixed Diet	No	1.62	50	19.1	76	130	80	98	99	10.2	7.5	178	216	9.0	28	496.5	477.7	505.5
Elementary	Unskilled	Yes	No	No	Mixed Diet	No	1.62	45	17.1	67	116	78	74	99	11.4	6.4	126	162	5.0	19	369.1	376.3	305.1
Illiterate	Unskilled	No	Yes	No	Mixed Diet	No	1.58	68	27.2	100	140	70	70	99	10.2	11.8	198	268	20.0	20	492.3	583.1	558.6
Illiterate	Unskilled	No	Yes	Yes	Mixed Diet	No	1.62	52	19.8	90	116	70	78	98	9.6	7.3	277	470	20.0	18	518	1151.7	321.8
Elementary	Unskilled	No	No	No	0	No	1.69	68	23.8	84	116	74	86	98	11.5	8.9	186	256	1.5	21	540.6	543.8	785.4
Elementary	Unskilled	Yes	Yes	No	Mixed Diet	No	1.6	52	20.3	86	110	70	86	99	8.7	7.2	270	351	15.0	20	772.2	741.2	723.3
High school	Skilled	No	No	No	Mixed Diet	No	1.56	53	21.8	70	120	80	78	99	13.9	7.4	180	242	30.0	22	556	652.3	523.9
High school	Unskilled	Yes	Yes	No	Veg	No	1.7	68	23.5	100	126	80	96	99	11.5	7.5	176	346	4.0	27	575.8	565.7	369.1
Illiterate	House wife	No	No	No	Veg	No	1.5	70	31.1	98	130	70	80	99	11.7	8.2	202	286	1.0	16	564.8	475.6	296.8
High school	Unskilled	No	Yes	No	Mixed Diet	Yes	1.7	63	21.8	98	130	80	78	99	9.3	8.4	178	298	1.0	14	412.9	466.4	680.4
Illiterate	Unskilled	Yes	Yes	No	Mixed Diet	No	1.62	55	21.0	77	130	80	84	99	10.2	9.8	242	349	3.0	17	762.4	761.8	582.1
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.48	50	22.8	85	120	80	78	99	8.9	8.9	237	349	4.0	23	626.9	823.5	523.6
nior High sch	Skilled	Yes	Yes	No	Mixed Diet	No	1.6	52	20.3	83	130	80	90	99	11.5	6.2	123	156	11.0	21	235.5	312.5	304.6
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.51	56	24.6	83	110	80	80	99	9.4	10.0	200	301	6.0	15	590.6	600.4	578.1
Elementary	Unskilled	Yes	Yes	Yes	Mixed Diet	No	1.52	78	33.8	88	140	90	84	99	12.9	8.3	123	228	4.0	23	323.5	393.5	371
Illiterate	House wife	No	No	No	Mixed Diet	No	1.58	68	27.2	77	130	80	90	99	7.8	6.3	102	146	2.0	17	556.4	656.7	599.7
igher seconda	Skilled	Yes	No	No	Mixed Diet	Yes	1.62	56	21.3	90	110	80	90	99	8.5	7.2	243	362	4.0	23	1160	598.4	321.3
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.51	50	21.9	82	100	60	80	99	12.8	6.8	178	203	2.0	15	434.8	385.5	218
Elementary	Unskilled	No	No	Yes	Mixed Diet	No	1.5	39	17.3	72	130	80	80	99	12.5	7.8	215	315	3.0	13	568.5	751.8	696.8
nior High sch	Unskilled	No	No	No	Mixed Diet	No	1.64	84	31.2	92	170	90	86	99	15.7	8.6	180	278	15.0	27	680.9	800.5	639.3
Illiterate	House wife	No	No	No	Mixed Diet	No	1.49	53	23.9	89	136	80	78	99	11.7	10.9	183	322	5.0	22	355.6	422	320
Illiterate	House wife	No	No	No	Mixed Diet	No	1.42	47	23.3	79	130	86	78	99	7.1	10.6	58	259	15.0	14	553.6	620.6	382.8
nior High sch	Skilled	No	No	No	Mixed Diet	No	1.5	55	24.4	92	126	70	80	99	11.6	8.5	196	264	1.0	27	468.3	505.5	425.6
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.59	60	23.7	100	130	84	88	99	12.7	9.7	202	278	5.0	18	377	465.9	324.5
nior High sch	Unskilled	No	Yes	No	Mixed Diet	Yes	1.55	47	19.6	79	116	70	80	99	11.6	6.7	220	320	1.0	22	726.5	729.5	551
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.54	37	15.6	72	136	70	98	99	9.7	7.3	190	300	3.0	17	619.9	651.5	643.1
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.56	75	30.8	106	130	76	78	99	12	10.6	312	418	2.0	19	815.4	905.7	352
Elementary	Unskilled	No	Yes	No	Mixed Diet	No	1.6	62	24.2	98	110	78	84	99	9.3	8.3	208	321	5.0	27	500.4	591.9	424.3
High school	Unskilled	No	No	No	Mixed Diet	No	1.62	85	32.4	96	170	90	80	99	12.6	7.9	198	302	3.0	27	445.4	592.5	323.1
nior High sch	Skilled	Yes	Yes	No	Veg	No	1.56	56	23.0	91	130	80	78	99	6.8	8.2	168	280	18.0	28	871.8	870.9	484.5
nior High sch	Unskilled	No	No	No	Mixed Diet	No	1.44	48	23.1	78	140	80	90	99	10.7	6.4	102	317	7.0	27	488.5	340.5	475.2
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.5	48	21.3	83	146	70	78	99	9.4	10.2	208	342	2.0	16	923.7	1336.4	832.8
nior High sch	Unskilled	No	Yes	No	Mixed Diet	No	1.63	70	26.3	93	136	80	80	99	10.2	6.6	132	186	3.0	26	564.2	535.8	413.8
High school	Self-employed	No	Yes	No	Mixed Diet	No	1.6	60	23.4	84	126	80	80	99	15.2	8.6	189	236	3.0	24	281.1	365.5	241
nior High sch	House wife	No	No	No	Mixed Diet	No	1.41	64	32.2	35	100	60	70	99	12.6	9.4	202	286	1.0	22	497.9	484.6	261.6
Illiterate	House wife	No	No	No	Mixed Diet	Yes	1.42	70	34.7	97	136	90	84	99	11.3	9.8	202	312	1.0	18	525.3	623.7	382.1
Elementary	House wife	No	No	No	Mixed Diet	No	1.3	45	26.6	78	126	70	80	99	12.7	10.2	212	368	1.0	23	628.9	760.8	331.8
Illiterate	Unskilled	No	Yes	No	Mixed Diet	No	1.68	63	22.3	87	130	80	84	99	16.1	12.2	302	402	3.0	20	1116.1	904.7	407.9
Illiterate	Unskilled	Yes	Yes	No	Mixed Diet	No	1.65	70	25.7	97	130	80	80	99	14.6	6.9	132	176	4.0	18	318.9	346.2	280.2
Elementary	Unskilled	Yes	Yes	No	Mixed Diet	No	1.61	58	22.4	85	140	80	68	99	13.5	7.2	202	278	3.0	23	423.8	427.8	292.1
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.54	45	19.0	74	116	70	88	97	8	11.5	343	402	12.0	16	1146.7	1170.9	1092.2
nior High sch	Skilled	Yes	Yes	No	Veg	Yes	1.7	98	33.9	117	120	80	84	99	12.6	7.3	108	162	1.0	29	385.4	349.5	345.7
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.48	58	26.5	90	123	70	84	99	10.8	9.8	258	386	2.0	16	1137.8	1088.3	437.9
nior High sch	Unskilled	No	Yes	Yes	Mixed Diet	No	1.67	57	20.4	80	110	60	84	99	14.2	12.2	201	298	15.0	22	770.3	720.1	375.2
Elementary	House wife	No	No	No	Mixed Diet	Yes	1.45	73	34.7	104	110	70	88	99	10.8	9.6	198	246	3.0	17	547.5	683.1	721.7
High school	House wife	No	No	No	Mixed Diet	No	1.56	74	30.4	104	120	70	74	99	10.8	8.9	210	287	2.0	25	626.6	559.1	419

Illiterate	Unskilled	No	No	No	Mixed Diet	Yes	1.58	50	20.0	88	126	70	80	99	10.9	8.0	230	402	3.0	16	896.1	691.5	817.9
High school	House wife	No	No	No	Mixed Diet	No	1.51	65	28.5	97	110	76	80	99	6.9	9.6	335	534	11.0	21	776.2	661.1	616
nior High sch	Unskilled	Yes	Yes	Yes	Mixed Diet	No	1.79	60	18.7	78	130	80	98	99	7.8	10.0	208	326	5.0	25	582.2	497.3	469
High school	Unskilled	Yes	Yes	No	Mixed Diet	Yes	1.79	47	14.7	73	120	80	78	99	15.3	10.2	256	312	12.0	20	596.5	520.2	492
Illiterate	Unskilled	No	No	No	Mixed Diet	Yes	1.49	65	29.3	99	130	90	84	99	8.2	9.6	190	287	1.0	17	548.2	498.2	261.1
gher seconda	Skilled	No	Yes	No	Mixed Diet	Yes	1.69	57	20.0	83	140	80	84	98	14.2	8.2	178	248	10.0	30	387.6	519.6	273.2
nior High sch	Skilled	Yes	Yes	Yes	Mixed Diet	No	1.65	50	18.4	75	116	70	80	98	12.5	10.5	208	318	2.5	22	440.3	518.5	252.5
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.53	55	23.5	86	130	80	96	99	8.9	10.2	207	310	10.0	16	384.7	445.1	702.4
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.52	40	17.3	70	114	66	76	99	10.8	5.9	126	160	3.0	16	510.3	520.5	379.7
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.5	66	29.3	92	130	80	78	98	12.5	11.4	206	274	5.0	18	659.9	542.8	489.4
Illiterate	Unskilled	No	Yes	Yes	Mixed Diet	No	1.62	69	26.3	92	136	84	84	99	13.4	11.2	257	472	3.0	16	598.5	482.1	567.2
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.47	46	21.3	82	120	70	86	99	7.6	7.6	126	188	1.0	20	492.2	476	378.7
Elementary	House wife	No	No	No	Mixed Diet	Yes	1.56	47	19.3	79	130	80	84	98	9.7	7.9	182	298	1.0	20	546.3	707.1	550.5
High school	Unskilled	No	No	No	Mixed Diet	No	1.72	68	23.0	83	140	70	80	99	8.2	8.8	167	310	23.0	27	287.6	265.6	232.7
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.58	67	26.8	102	136	82	84	98	10.2	6.9	152	176	8.0	16	696	912.6	919
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.56	44	18.1	81	126	72	78	99	10	8.3	187	276	2.0	16	438.1	504.4	339.5
Illiterate	Farmer	No	No	No	Mixed Diet	No	1.52	43	18.6	80	116	80	84	99	10.7	8.8	199	366	8.0	14	729.4	631.2	500.3
High school	Unskilled	No	No	No	Mixed Diet	No	1.62	64	24.4	100	136	78	90	99	10.8	7.4	186	220	15.0	27	1225.3	1026.9	488.7
Illiterate	House wife	No	No	No	Mixed Diet	Yes	1.45	52	24.7	87	117	60	80	99	9.1	9.8	230	267	1.0	18	667	658.9	489.2
High school	Skilled	Yes	Yes	Yes	Mixed Diet	Yes	1.63	55	20.7	83	116	78	90	98	9.5	7.8	176	219	12.0	24	213.8	265.7	300.6
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.55	52	21.6	79	116	70	78	99	12.3	7.5	146	198	4.5	20	229.2	245.4	212
High school	Self-employed	Yes	Yes	No	Mixed Diet	No	1.61	60	23.1	94	136	84	78	99	11.5	9.3	219	328	4.0	26	424.5	434.7	336
High school	Unskilled	No	No	No	Mixed Diet	No	1.6	68	26.6	94	136	78	70	99	10.8	7.2	178	210	20.0	23	497.8	434.9	286
Illiterate	Unskilled	No	No	Yes	Mixed Diet	No	1.51	51	22.4	86	130	80	90	99	13.3	8.9	201	289	15.0	19	259.9	278.6	240
Illiterate	Unskilled	No	Yes	No	Mixed Diet	No	1.68	51	18.1	78	126	78	80	99	13.2	8.2	118	339	3.0	15	516.7	547.7	583.8
Illiterate	House wife	No	No	No	Mixed Diet	No	1.76	66	21.3	76	130	78	78	99	9.8	7.2	248	541	10.0	22	439.7	430	489.6
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.58	55	22.0	88	116	70	78	99	11.8	6.3	132	167	1.0	18	506.3	433.9	268.9
High school	Unskilled	No	Yes	Yes	Mixed Diet	No	1.52	68	29.4	96	116	80	86	99	10	7.6	210	268	15.0	22	326.6	430.9	388.7
Illiterate	Unskilled	No	No	Yes	Mixed Diet	No	1.42	40	19.8	78	110	70	68	99	11	13.4	354	492	3.0	16	414.4	372.6	542.4
Elementary	Unskilled	No	Yes	No	Mixed Diet	No	1.7	80	27.7	91	110	70	84	99	15.7	9.0	147	281	1.0	24	410.6	478.7	330.1
Degree	Skilled	Yes	Yes	Yes	Mixed Diet	No	1.54	45	19.0	78	140	86	74	99	8.9	8.2	198	268	2.0	25	587.1	568.2	367.4
Degree	Skilled	No	Yes	No	Mixed Diet	No	1.58	56	22.4	78	130	80	80	99	15.2	8.6	186	276	1.0	29	303.7	362.4	241.2
Elementary	Unskilled	No	No	Yes	Veg	No	1.48	48	21.9	78	100	60	88	99	12.9	6.4	102	142	1.0	17	1014	937.3	671.3
High school	Unskilled	No	Yes	No	Mixed Diet	No	1.56	67	27.5	94	130	80	94	99	8.4	10.2	228	428	8.0	23	479	461.5	400.4
nior High sch	Skilled	No	No	No	Mixed Diet	No	1.55	58	24.1	110	140	78	80	99	13	9.1	178	276	1.0	20	433	469.6	446.3
gher seconda	Unskilled	No	No	No	Mixed Diet	No	1.6	67	26.2	95	110	80	80	99	15.1	10.9	249	332	5.0	24	320.9	308.1	181.3
nior High sch	House wife	No	No	No	Mixed Diet	Yes	1.53	63	26.9	88	110	70	80	99	12.8	8.8	160	210	12.0	23	558.1	614.1	561
Illiterate	Unskilled	Yes	Yes	Yes	Mixed Diet	No	1.6	52	20.3	84	110	70	68	99	8.2	8.9	180	310	5.0	21	502.3	471.4	310.1
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.55	51	21.2	90	116	70	86	99	10.9	8.0	160	270	3.0	16	847.2	756.6	660.5
nior High sch	House wife	No	No	Yes	Mixed Diet	No	1.48	70	32.0	98	140	100	88	99	12.5	9.3	220	310	3.0	26	476.9	564.1	464.9
Degree	Skilled	No	Yes	No	Mixed Diet	No	1.62	55	21.0	82	110	80	80	99	8.6	9.6	320	408	15.0	24	619	580.2	464.2
High school	Skilled	Yes	Yes	Yes	Mixed Diet	Yes	1.54	44	18.6	71	110	60	80	92	13.4	11.8	317	399	1.0	27	883.1	1026.7	318.7
High school	Unskilled	No	No	No	Mixed Diet	No	1.58	85	34.0	104	110	70	80	99	11.7	9.0	236	295	3.0	30	408.4	577.7	260.6
Illiterate	House wife	No	No	No	Mixed Diet	No	1.58	58	23.2	100	140	80	80	99	10.6	7.5	212	270	10.0	22	638.5	643.7	573
Illiterate	Unskilled	No	No	Yes	Mixed Diet	No	1.6	62	24.2	92	120	80	68	99	11	8.8	130	292	1.0	15	386.7	528.6	462.3
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.59	45	17.8	80	100	68	78	99	11.5	10.2	256	328	1.0	15	737.7	700.8	866.2
Illiterate	House wife	No	No	No	Mixed Diet	No	1.47	57	26.4	85	120	70	80	91	12.5	7.4	145	208	1.0	22	321.6	380.7	326.1
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.37	34	18.1	80	130	80	84	99	10.5	12.1	348	408	10.0	15	768.8	873.2	928.4
nior High sch	Unskilled	No	No	No	Mixed Diet	No	1.7	80	27.7	98	110	70	80	99	12.6	10.8	229	449	1.0	28	262.2	386.2	213.6
High school	Unskilled	Yes	Yes	Yes	Mixed Diet	No	1.58	55	22.0	86	110	60	80	99	13.9	12.0	190	302	2.0	22	548.9	553.2	481.9
Elementary	Unskilled	Yes	Yes	No	Mixed Diet	No	1.62	62	23.6	98	120	70	84	99	13.6	8.1	115	189	1.0	23	460.5	334.4	318.8
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.51	52	22.8	79	160	80	80	99	10.9	9.2	198	278	5.0	16	544.1	591.5	502.5
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.42	53	26.3	76	100	60	80	99	13.2	7.7	208	268	1.0	18	354.2	391.4	466.6
High school	House wife	No	No	No	Mixed Diet	Yes	1.59	75	29.7	105	120	70	120	99	14.2	10.2	210	312	2.0	20	483.8	562.8	566.4
nior High sch	Skilled	No	No	No	Mixed Diet	No	1.46	56	26.3	86	120	70	68	99	13.1	10.6	301	364	3.0	29	394.3	463.4	312.3
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.61	60	23.1	91	130	90	68	99	12.2	11.2	379	430	3.0	21	850.3	799.3	756.6
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.5	55	24.4	88	100	70	80	99	12.1	6.7	99	133	1.0	20	703.4	740.1	366.8
nior High sch	Unskilled	Yes	Yes	No	Mixed Diet	No	1.56	63	25.9	98	130	80	80	99	12.5	6.1	98	141	6.0	24	274.6	343.9	342.4
nior High sch	Self-employed	No	No	No	Veg	No	1.72	83	28.1	105	130	60	88	99	12.8	7.9	180	290	3.0	25	798.8	793.9	292.4
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.62	91	34.7	112	130	80	80	99	13.1	7.2	192	252	11.0	26	663	719.9	308
Elementary	Self-employed	No	Yes	Yes	Mixed Diet	No	1.61	67	25.8	91	130	90	86	99	11.1	9.0	186	276	4.0	21	554.8	573.2	531.2
Elementary	Unskilled	No	Yes	No	Mixed Diet	No	1.52	39	16.9	68	130	70	84	98	10.3	6.2	128	162	2.0	22	272.9	285.3	328.6
Elementary	House wife	No	No	No	Mixed Diet	Yes	1.51	50	21.9	95	110	70	68	99	13.6	9.5	168	210	1.0	20	462.8	524.6	604.9
Degree	Self-employed	No	No	No	Mixed Diet	No	1.75	75	24.5	107	160	110	68	99	10.2	9.6	173	291	6.0	26	448.3	490	428.5
nior High sch	Skilled	Yes	Yes	No	Mixed Diet	No	1.6	67	26.2	94	140	90	98	99	14.9	9.6	192	250	15.0	27	776.8	768.9	419.7
High school	Unskilled	Yes	Yes	No	Mixed Diet	Yes	1.6	75	29.3	104	140	90	80	99	9.2	10.5	264	374	24.0	25	775.5	746.5	512.9
Illiterate	Unskilled	No	No	Yes	Mixed Diet	No	1.42	57	28.3	100	100	70	86	97	11.2	7.8	218	286	2.0	17	500.6	564.1	542.9
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.4	40	20.4	76	90	60	68	99	9.4	6.2	96	106	1.0	22	528.4	512.1	801.6
Elementary	Self-employed	No	No	No	Mixed Diet	Yes	1.43	60	29.3	100	110	70	84	99	10.1	9.8	228	308	8.0	21	770.9	848.1	794.6
Elementary	Unskilled	Yes	Yes	Yes	Mixed Diet	Yes	1.62	54	20.6	92	130	80	84	99	12.1	7.2	189	235	20.0	22	824.1	793.7	529.8
Illiterate	Self-employed	No	No	No	Mixed Diet	No	1.56	50	20.5	81	100	80	88	97	10	8.7	170	313	3.0	17	348.9	343.3	602.4

Illiterate	Farmer	No	Yes	No	Mixed Diet	Yes	1.62	50	19.1	82	130	80	68	98	10.4	11.2	366	590	4.0	17	324.8	301.9	297.2
High school	Skilled	Yes	Yes	No	Mixed Diet	No	1.62	52	19.8	93	110	80	80	99	15.3	8.0	260	397	1.0	21	225.6	251	262.4
Elementary	Unskilled	Yes	Yes	No	Mixed Diet	No	1.65	72	26.4	94	136	86	76	99	13.8	10.6	186	278	3.0	20	300.1	348.4	228.9
Degree	Retired	No	No	No	Veg	No	1.67	65	23.3	91	150	90	72	97	10.2	8.9	165	256	28.0	29	476.4	584.7	343.7
Elementary	Unskilled	No	Yes	No	Mixed Diet	Yes	1.74	62	20.5	94	140	86	80	98	13.2	7.8	143	198	10.0	25	282	255.4	218.5
nior High scho	Farmer	No	Yes	No	Mixed Diet	No	1.79	77	24.0	94	130	86	68	99	11.8	6.9	132	164	1.0	29	506.7	412	302.3
Elementary	Unskilled	No	No	No	Mixed Diet	Yes	1.62	61	23.2	100	160	90	80	99	14.1	7.3	295	468	1.0	18	659.9	605.7	281.7
Elementary	Unemployed	Yes	Yes	No	Mixed Diet	No	1.64	68	25.3	95	136	78	68	98	10.6	8.6	225	348	4.0	26	492	595.9	480.3
nior High scho	Retired	No	No	No	Mixed Diet	No	1.76	65	21.0	100	130	90	80	99	11.8	7.8	168	280	16.0	27	492.5	595.1	285.1
nior High scho	Farmer	No	No	No	Mixed Diet	No	1.71	52	17.8	82	146	90	92	98	12.4	6.8	142	256	3.0	29	499.5	465.7	394.9
nior High scho	Skilled	Yes	Yes	Yes	Mixed Diet	No	1.59	69	27.3	94	150	100	98	99	12.8	5.9	82	138	11.0	28	275.6	266.5	351.7
Elementary	Skilled	Yes	Yes	Yes	Mixed Diet	No	1.57	69	28.0	87	110	80	80	98	15.2	6.0	178	227	1.0	28	361.2	349.9	278.7
High school	Farmer	Yes	Yes	No	Mixed Diet	No	1.53	45	19.2	70	130	70	70	99	10.9	10.5	240	382	2.0	16	421.3	430.4	306.5
Illiterate	Farmer	No	No	No	Mixed Diet	No	1.67	55	19.7	84	130	80	80	99	12	6.8	197	219	1.5	15	599.2	517.4	287.6
High school	Unskilled	No	No	No	Mixed Diet	No	1.61	68	26.2	94	130	80	90	99	13.6	9.0	180	310	1.0	22	278.7	325.2	337.1
Elementary	Farmer	Yes	Yes	Yes	Mixed Diet	No	1.56	50	20.5	76	150	86	58	98	11.6	8.2	160	240	5.0	20	561.9	655.7	574.4
High school	Unskilled	No	Yes	Yes	Mixed Diet	Yes	1.58	58	23.2	80	150	90	86	99	12.8	6.4	109	142	10.0	20	433.6	443.1	316.2
High school	Unskilled	No	Yes	No	Mixed Diet	No	1.61	45	17.4	74	110	80	80	99	12.8	6.4	102	138	8.0	23	737.8	689	689
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.57	66	26.8	92	116	70	86	99	12.7	9.2	129	232	1.0	10	501	564.8	530.2
High school	Skilled	No	Yes	No	Mixed Diet	No	1.58	70	28.0	106	130	70	60	99	15.8	10.0	231	304	8.0	22	404.7	396.6	299.5
gher seconda	Unskilled	No	No	No	Mixed Diet	No	1.61	50	19.3	82	140	88	78	99	11.9	12.2	332	427	6.0	27	538.5	633.4	498.8
High school	Unskilled	No	Yes	No	Mixed Diet	No	1.49	57	25.7	84	110	80	78	99	15.1	8.0	152	322	4.0	24	483	446.8	340.4
Elementary	Unskilled	No	Yes	Yes	Mixed Diet	No	1.65	78	28.7	98	146	90	90	99	12.6	6.4	110	209	7.0	21	318.3	338	314.3
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.47	60	27.8	102	110	70	80	99	11.4	6.6	104	127	1.0	22	600.7	469.4	281.3
nior High scho	House wife	No	No	No	Mixed Diet	Yes	1.46	60	28.1	98	130	80	90	98	13.2	7.6	174	324	7.0	27	398.3	413.2	248.2
nior High scho	Skilled	No	Yes	No	Mixed Diet	No	1.6	50	19.5	80	120	70	90	99	15.8	7.0	168	333	4.0	22	576	555.9	459.4
Degree	Retired	No	Yes	Yes	Mixed Diet	Yes	1.59	80	31.6	109	140	80	86	99	12.2	5.8	99	123	2.0	23	489.2	512.1	504.6
gher seconda	Skilled	No	Yes	Yes	Mixed Diet	No	1.54	63	26.6	94	130	80	94	98	15.7	8.0	196	348	1.0	23	517.4	539.4	404.4
Illiterate	Unskilled	No	No	No	Mixed Diet	Yes	1.47	54	25.0	82	122	80	80	98	10.8	7.6	180	341	6.0	20	376.6	307.3	207.7
Elementary	Unskilled	No	No	Yes	Mixed Diet	No	1.42	52	25.8	82	120	80	88	99	9.2	9.8	222	370	10.0	21	544.7	526.4	416.1
Illiterate	Unskilled	No	No	Yes	Mixed Diet	No	1.56	54	22.2	80	126	80	84	99	10.8	10.3	123	221	10.0	16	609.6	695.7	439.1
Illiterate	House wife	No	No	No	Mixed Diet	No	1.58	74	29.6	105	126	80	88	99	6.1	7.4	156	218	17.0	17	443.3	559.2	576.7
Elementary	House wife	No	No	No	Mixed Diet	No	1.53	69	29.5	98	150	80	80	98	9.4	5.2	92	128	15.0	25	281.4	320.5	304.4
gher seconda	Skilled	No	No	No	Mixed Diet	No	1.51	54	23.7	78	112	70	88	99	9.8	8.2	122	224	8.0	29	298	307.3	470.4
nior High scho	Unskilled	Yes	Yes	No	Mixed Diet	No	1.67	64	22.9	82	146	90	78	99	7.3	7.4	156	210	10.0	27	433	385.3	362.3
Degree	Self-employed	No	No	No	Mixed Diet	No	1.66	70	25.4	102	140	82	70	99	12.7	6.4	108	142	5.0	28	354	396	453.3
High school	Unskilled	Yes	Yes	Yes	Mixed Diet	Yes	1.62	62	23.6	88	130	80	70	99	11.6	7.5	331	218	14.0	24	1058.5	1017.1	985.7
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.45	40	19.0	80	110	70	70	99	12	6.6	108	178	2.0	25	284.6	429.1	522.7
Diploma	Self-employed	Yes	Yes	No	Mixed Diet	Yes	1.55	75	31.2	102	160	80	88	99	10.8	8.0	178	219	2.0	28	282.1	260.6	502.9
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.52	68	29.4	100	130	80	90	99	12.6	7.1	148	192	10.0	22	789.2	687.7	380.1
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.46	60	28.1	78	130	80	80	99	12.7	8.4	185	268	3.0	70	403.3	437.9	570.2
High school	House wife	No	No	No	Mixed Diet	Yes	1.49	63	28.4	82	146	84	68	99	9.3	6.8	149	167	12.0	21	449.4	372.6	431.7
Degree	Skilled	No	No	No	Mixed Diet	No	1.62	77	29.3	110	130	80	80	99	13.5	6.9	112	195	2.0	27	440.7	476.2	340.6
Degree	House wife	No	No	No	Mixed Diet	No	1.55	63	26.2	106	113	80	98	99	10.6	6.9	140	164	7.0	27	330.3	477.9	349.5
Degree	Retired	Yes	Yes	No	Mixed Diet	No	1.7	63	21.8	90	116	88	88	99	12.8	7.8	168	286	5.0	28	304.9	273.4	310.9
nior High scho	Unskilled	No	Yes	Yes	Mixed Diet	No	1.71	55	18.8	83	130	90	98	99	13.8	11.0	280	420	15.0	26	308.4	352.8	311.8
Degree	Skilled	No	No	No	Mixed Diet	No	1.84	84.7	25.0	102	140	90	98	99	11.2	7.6	146	294	12.0	30	480	455.5	377.3
gher seconda	House wife	No	No	No	Mixed Diet	Yes	1.54	58	24.5	89	110	60	84	99	10	10.9	136	219	14.0	28	574.5	606	495.1
Degree	Skilled	No	Yes	No	Mixed Diet	No	1.62	72	27.4	104	140	80	80	99	10.2	8.6	173	278	1.0	29	280.5	309.3	300.6
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.47	60	27.8	90	130	80	90	99	10.5	9.8	198	320	20.0	22	566.8	495.6	517.8
Elementary	Unskilled	Yes	Yes	No	Mixed Diet	No	1.61	80	30.9	104	180	100	80	99	11	7.9	186	220	2.0	25	500	538.9	303.6
nior High sch	Self-employed	No	Yes	No	Mixed Diet	No	1.64	69.8	26.0	96	120	70	84	98	14.2	8.3	176	232	18.0	27	275.9	263.4	237.7
Degree	Skilled	No	No	No	Mixed Diet	No	1.63	60.6	22.8	100	130	86	84	99	15.5	9.3	155	299	6.0	28	348.5	354	452.3
Diploma	Skilled	No	No	No	Mixed Diet	No	1.5	70	31.1	99	126	84	84	99	12.4	6.8	120	158	3.0	29	262.4	278.6	269.5
gher seconda	Self-employed	No	Yes	Yes	Mixed Diet	Yes	1.64	87	32.3	110	140	80	96	99	13.3	8.7	170	284	10.0	28	276.8	248.4	256.5
Diploma	Skilled	No	Yes	No	Mixed Diet	No	1.5	53	23.6	90	136	80	88	99	13.8	8.2	160	262	7.0	26	410.6	410.1	351
gher seconda	House wife	No	No	No	Mixed Diet	Yes	1.48	59	26.9	94	110	70	68	99	13.1	9.8	180	280	10.0	24	496.2	419.4	338.4
High school	House wife	No	No	No	Mixed Diet	Yes	1.56	60	24.7	94	170	86	84	99	12.8	6.8	145	260	15.0	16	685.9	543.4	515.7
Elementary	House wife	No	No	No	Mixed Diet	Yes	1.44	46	22.2	96	120	80	90	99	10.5	5.8	76	128	6.0	24	437.3	423.7	396.3
Elementary	House wife	No	No	No	Veg	No	1.59	49	19.4	74	140	86	88	99	10	7.1	146	186	15.0	16	871.2	860.7	637.9
Degree	Retired	Yes	Yes	No	Mixed Diet	No	1.66	60	21.8	88	150	90	68	99	10.6	8.2	178	240	17.0	29	546.1	467.7	364
Illiterate	Unskilled	No	Yes	No	Mixed Diet	Yes	1.58	63	25.2	100	140	80	90	99	15.3	6.3	142	198	10.0	18	855.6	848.6	635.1
Elementary	Unskilled	Yes	Yes	No	Mixed Diet	Yes	1.54	66	27.8	102	136	84	80	99	13.7	9.8	178	256	12.0	24	701.9	743.6	388.2
Illiterate	House wife	No	No	No	Mixed Diet	No	1.8	42	13.0	84	130	80	86	99	7.4	8.4	227	230	10.0	19	919.9	872.2	501.4
nior High scho	Skilled	Yes	Yes	No	Mixed Diet	No	1.76	76	24.5	90	130	80	78	99	10.3	8.4	180	256	8.0	30	369.6	356.9	337.7
Illiterate	House wife	No	No	No	Mixed Diet	No	1.53	53	22.6	86	130	80	86	98	11.8	10.3	267	320	15.0	17	487.50	588.7	340
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.62	84	32.0	112	126	80	84	99	13.5	9.8	210	289	1.0	20	1180.2	1101.7	633.7
nior High scho	Unskilled	No	No	No	Mixed Diet	Yes	1.4	47	24.0	80	110	70	90	99	11.1	7.6	227	357	13.0	26	477.6	462.6	262.6
Illiterate	House wife	No	No	No	Mixed Diet	No	1.54	59	24.9	92	110	80	88	99	12	8.9	176	258	15.0	22	522.4	534.2	499.9
Elementary	Unskilled	Yes	Yes	No	Mixed Diet	No	1.67	57	20.4	75	176	84	86	99	9	11.6	240	310	8.0	27	465.2	635.8	291.9
High school	Unskilled	No	No	No	Mixed Diet	Yes	1.68	70	24.8	90	130	80	88	99	10.4	8.2	178	210	30.0	18	367.9	730.5	452.1

nior High scho	Skilled	No	Yes	No	Mixed Diet	Yes	1.62	57.6	21.9	100	130	86	78	99	12.5	7.5	148	201	16.0	29	426.6	338.6	357.7
nior High scho	Unskilled	Yes	Yes	Yes	Mixed Diet	Yes	1.7	65	22.5	93	140	86	78	99	9.5	9.1	138	202	20.0	24	464.8	403.3	199.7
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.49	70	31.5	100	126	80	86	99	11.5	11.3	232	386	9.0	13	677.7	572.3	608.2
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.62	52	19.8	92	110	80	80	99	7.3	8.8	186	224	1.5	16	456.6	472.9	502.5
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.49	67	30.2	94	110	80	88	98	11.9	12.5	246	368	1.5	15	862.7	665.6	703.7
Elementary	House wife	No	No	No	Mixed Diet	No	1.42	54	26.8	98	140	60	72	98	10	7.3	164	263	15.0	26	521.9	463.6	538.3
Elementary	Retired	No	No	No	Mixed Diet	Yes	1.55	62	25.8	100	140	80	68	99	14.2	10.6	237	376	3.0	15	610.8	736.9	552.1
Elementary	Skilled	No	Yes	No	Mixed Diet	No	1.62	50	19.1	70	110	70	80	99	11	10.9	227	321	1.0	16	515.7	461.2	341.9
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.63	82	30.9	110	136	88	74	98	11.7	8.2	168	246	4.0	20	477.8	592.1	465.2
High school	Unskilled	Yes	Yes	Yes	Mixed Diet	No	1.72	45	15.2	78	116	72	88	96	8.6	7.1	256	403	1.5	25	308.9	305.6	232.7
High school	Skilled	No	No	No	Mixed Diet	No	1.51	57	25.0	81	110	80	80	99	7.9	8.9	196.0	262	8.0	21	655.6	783.6	482.2
Elementary	House wife	No	No	No	Mixed Diet	No	1.57	59	23.9	91	130	80	76	99	10.9	7.3	160	218	1.0	25	319.6	337.3	352.8
Elementary	Unskilled	No	Yes	No	Mixed Diet	No	1.52	71	30.7	99	130	80	90	99	11.2	10.3	321	417	1.0	22	1161.5	1080.2	693.2
Illiterate	House wife	No	No	No	Mixed Diet	No	1.5	68	30.2	96	120	80	86	99	10.8	10.0	280	348	4.0	19	439.8	436.7	339.6
Illiterate	Farmer	No	No	No	Mixed Diet	Yes	1.52	54	23.4	88	120	80	74	99	10.6	6.2	112	195	2.0	19	351.6	362.1	323.3
Degree	Skilled	Yes	No	No	Mixed Diet	No	1.72	65	22.0	80	116	68	76	98	16	8.8	198	287	1.5	29	339.7	245	187
nior High scho	Skilled	No	Yes	No	Mixed Diet	Yes	1.72	59	19.9	86	120	80	74	99	9.4	8.2	242	310	3.0	22	790.7	815.8	903.6
High school	Unskilled	No	Yes	No	Mixed Diet	Yes	1.72	70	23.7	87	120	80	84	99	12.2	10.8	345	478	1.0	22	931.5	1037.6	377.4
nior High scho	Unskilled	No	Yes	No	Mixed Diet	No	1.56	60	24.7	92	170	86	98	99	16.2	8.1	167	209	1.5	25	915.6	851.9	450.8
Elementary	House wife	No	No	No	Mixed Diet	Yes	1.67	60	21.5	99	130	80	80	99	10	6.8	133	220	1.0	20	381.5	389.6	372.9
nior High scho	House wife	No	No	No	Mixed Diet	No	1.43	48	23.5	84	110	70	86	99	12.4	7.2	148	210	1.0	17	516.2	603	269.2
Illiterate	Unskilled	No	No	No	Mixed Diet	No	1.67	50	17.9	89	136	84	80	99	9.5	8.6	203	282	0.5	12	533.5	455.1	489.4
Elementary	Unskilled	No	No	No	Mixed Diet	No	1.62	65	24.8	87	110	80	68	98	11.4	8.2	237	343	1.0	13	406.4	422.9	329.5